U. S. DEPARTMENT OF LABOR
W. B. WILSON, Secretary
WOMEN'S BUREAU
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THE NEW POSITION OF WOMEN IN AMERICAN INDUSTRY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF LABOR,
WOMEN'S BUREAU,
Washington, August 27, 1920.

SIR: We submit herewith a report giving the results of an investigation of the new position of women in American industry, based on statistics of their employment during the war and in the postwar period. This investigation was initiated by Miss Mary Van Kleeck, while Director of the Women's Bureau, at the request of Miss Mary E. McDowell, of Chicago, who, returning from a trip to France and England, made on behalf of the War Work Council of the Young Women's Christian Association, was convinced that more information should be made available about the new outlook for women in industry in the United States, and the actual effects of the war on their economic position. Through the efforts of Miss McDowell the survey was financed by the War Work Council in view of the fact that the current appropriation of the Women's Bureau was too small to include this inquiry in its program. As it was anticipated that statistics secured by Federal departments would form its basis, however, the War Work Council undertook the study with the expectation that the report would be published by the Women's Bureau. The original report, as submitted by the War Work Council, was revised and condensed by the Women's Bureau.

Respectfully submitted.

MARY ANDERSON, *Director.*

Hon. W. B. WILSON,
Secretary of Labor.

INTRODUCTION.

To determine not only what women in industry in the United States did for the World War but also what the World War did for women in industry this survey was undertaken. Within its main objective were included many questions from whose answers shot up gleams or glints of promise or danger. Were great numbers of women forced into the labor vacuum created by enlistments and the military drafts and blown out again by the back rush that started with the close of the war and demobilization? Did the women make their mark on such industries as efficient workers or did the industries leave a scar of failure upon them? Did the World War, stripping away the thick padding of industrial tradition as to what pursuits were and what were not suitable occupations for women, uncover new capabilities in women for service and new opportunities for women to serve? If the World War has permanently loosened the century-long grip which the traditional woman-employing industries have upon woman labor, under what conditions are the new industries placing upon it their lasting hold? What is the attitude of organized labor toward the retention of women in the new occupations and what is the probable influence of this attitude upon the course of employers and upon the prevailing industrial standards? Does the war-time experience in the employment of woman labor offer available suggestions for so shaping the vocational training of women as to bring it into full accord with the possibilities of woman labor as revealed by its emergency service? Finally, can the war-born opportunities for earning a livelihood be made to stimulate the sense of self-dependence, growing out of proved skill, which should be an insurance against misfortune and a source of poised strength to the growing army of wage-earning women?

To throw light on these and related questions of equal importance it was necessary to make a nation-wide survey and to enlist therein the cooperation of employers in all leading industries. Even with the ungrudging and unrestricted cooperation of employers and organization leaders, however, it would not have been possible in the time and for the money available to uncover the essential facts had it not been that, without in any way disclosing confidential matters, access was given to a great mass of pertinent data contained in the records of Government war agencies.[1]

[1] Because of the availability of this unpublished material the results here presented and the conclusions drawn concerning the status of women in industry, previous to our entrance into the war, rest, as explained in Section II of this report (p. 36), upon data from nearly 9,000 firms, employing over 3,000,000 workers in 1916. The results and conclusions concerning women in industry during the World War rest upon reports from nearly 15,000 firms, employing during the "peak load" before the armistice approximately two and a half million workers, or over one-third of the average number of wage earners in all manufacturing industries, according to the United States Census of Manufactures for 1914. Because of the generous cooperation of employers the deductions concerning the post-war status of women in industry rests upon reports from over thirteen hundred of these firms, employing in August, 1919, nearly 700,000 workers. The intensive study of the results of substitution is based upon reports from 562 of the 3,558 firms which had substituted during the war and up to August, 1919, over 68,000 women in work previously done by men. Although the policy of selecting firms employing 25 wage earners or more (adopted to secure the largest body of workers at a minimum of clerical service) reduces the proportion of firms covered, the per cent of workers included shows that the industries are liberally represented. The postwar data are further supplemented by unpublished records of United States Employment Service.

Information in the possession of such Federal bodies as the War Industries Board and the United States Department of Labor and its Employment Service was put at the disposal of this survey. Some of the material covering the period in 1916 immediately preceding our entrance into the war was secured by the National League for Woman's Service working in official cooperation with the Government. These official and semiofficial records were supplemented by intensive first-hand field studies of substitution of women on men's work and of the employment of women after the armistice.

SECTION I.

THE NEW POSITION OF WOMEN IN AMERICAN INDUSTRY.

WHAT THE WORLD WAR DID TO INDUSTRY.

To get a clear picture of what women in American industries did for the World War it is necessary to bear in mind just what the World War did to industry. The great conflict wrenched the whole industrial machine with great violence, forced extensive readjustments, and a general regearing to make the speed and carry the load demanded by the all-nation contest.

SHIFT FROM PEACE TO WAR-TIME PRODUCTION.

This quick shift from a peace to a war footing contributed as much at first to the dislocation of normal industrial conditions as did the drafting of millions of men from the ranks of producers to the service of the Army and Navy. The wheels of industries that had been turning out plowshares and pruning hooks of peace were suddenly reversed to make the guns and grenades, the shells and the shrapnel, the bayonets and bolos, and the other dread "swords and spears" of modern warfare. For the production of these implements of destruction the Government drafted the forces and equipment of the makers of steel and iron, of forging and casting foundries, of producers of hardware for builders and for households. The makers of bathtubs and plumber supplies, of farm implements and dairy utensils; the firms that made cash registers, typewriters, calculating machines and all the other devices for battling with commercial figures; the firms that fashioned bird cages, fishing tackle and sporting goods, all filed into the ranks of "war industries" to produce rifles by the million and cartridges by the billion, bombs by the boat load, and artillery by the acre.[1]

The tremendous range of manufacture required to equip our forces for actual warfare is reflected in the War Department's official statement that "in the American ordnance catalogue of supplies during the recent war there were over a hundred thousand separate and distinct items."[2]

Then the development of aerial warfare involved the virtual creation of a new industry in America. "This meant," says the Assistant Secretary of War in his official report as Director of Munitions, "not only the equipping of factories, but the procurement and sometimes the actual production of the raw materials. * * * Wood, sheet steel, wire, cloth, varnish—these are the principal components

[1] For an account of the drift of industry from peace to war products see pp. 50-84, of this report.
[2] America's Munitions 1917-18, Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919, p. 21.

of an airplane."[3] The war's requirements for each of these products were straining the industries without the added demands of the aerial battle fields, but the mills and factories had not only to produce the planes and their engines, but they had to equip them with weapons of offense and defense. In further discussion of the requirements of the aerial warfare the Assistant Secretary of War says:[4]

> The war in the air put added demands upon ordnance. It required the stripped machine-gun firing cartridges so rapidly that their explosions merged into a single continuous roar, yet each shot so nicely timed that it passed between the flying blades of the propeller. There had to be electric heaters for the gun mechanisms to prevent the oil which lubricated them from becoming congealed in the cold of high altitudes. The airplane guns required armor-piercing bullets for use against armored planes, incendiary bullets to ignite the hydrogen of the enemy's balloon or to fire the gasoline escaping through the wound in the hostile airplane's fuel tank, and tracer bullets to direct the aim of the aerial gunner. Other equipment for the airman included shot counters, to tell him instantly what quantity of ammunition he had on hand, and gun sights, ingeniously contrived to correct his aim automatically for the relative speed and direction of the opposing plane. These were all developments in ordnance brought about by the great war, and in each case they involved problems for the production organization to solve. Then there were the drop bombs of aerial warfare, of many gradations in weight, * * * bomb sights to determine the moment when the missle must be dropped in order to hit its target, sights which corrected for the altitude, the wind resistance, and the rate of speed of the airplane, and mechanisms to suspend the bombs from the plane and to release them at the will of the operator.
>
> * * * * * * *
>
> It will be noted that the most important articles * * * are * * * of a noncommercial type. In other words, they are not the sort of things that the industry of a country builds in time of peace, nor learns how to build.[5]

Even this vivid account of the swift and complete shift from peace to war requirements does not touch, of course, the tremendous demands put upon industry by the requirements of the Navy.

THE DEMAND FOR QUANTITY PRODUCTION.

The strain was enhanced and complicated by the inescapable urge for unparalleled quantity production in all industries essential to the prosecution of the war.

The imposing array of supplies required to clothe and feed, to house and maintain nearly 4,000,000 men and to provide for transporting them overseas constituted in itself a load of submerging weight. The War Department's official statement previously mentioned visualizes the strain on industry for subsistence, thus:[6]

> Consider these millions of soldiers as one composite, gigantic man in khaki; compress the war period into a single hour, the dinner hour; and it will be seen that the American fighter consumed what might be called a sizeable meal. Let us say that he started off with the main course. The roast of beef weighed over 800,000,000 pounds. It was flanked by a rasher of bacon weighing 150,000,000 pounds. Over 1,000,000,000 pounds of flour went into the loaf of bread, while, to spread the bread there was a lump of butter weighing 17,500,000 pounds and another lump of oleomargarine weighing 11,000,000 pounds. As a side dish this giant had over 150,000,000 pounds of baked beans. * * * The potatoes weighed 487,000,000 pounds. To add gusto to his appetite there were 40,000,000 pounds of onions. Then scattered over the table were such items as 150,000,000 cans of corn, peas, and string beans

[3] America's Munitions, 1917-18, Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919, pp. 243-244.
[4] Ibid., p. 24.
[5] Ibid., p. 435.

* * * 50,000,000 cans of salmon and 750,000 tins of sardines. Then there was a huge bowl of canned tomatoes, nearly 190,000,000 tins supplying its contents. For dessert he had 67,000,000 pounds of prunes and 40,000,000 pounds of evaporated peaches and apples. The sugar for sweetening various dishes weighed 350,000,000 pounds. He washed it all down with a draft made of 75,000,000 pounds of coffee, thinned with 200,000,000 cans of evaporated milk. The bill for the meal, paid by the American public, amounted to $727,092,430.44, this figure to December 1, 1918.

America's stocks, flocks, and farms had to supply this food but America's industries had to prepare it, can it, or pack it in American-made containers and ship it overseas.

There were 800,000,000 square yards of cotton textiles alone exacted by the Army from the cotton mills of America.[7] Add to this the woolen and knit goods required for clothing; the enormous yardage of silk and cotton and other fabrics for balloons, airplane wings, tents, and other equipage; the millions of shoes and gloves and other articles of leather and the tons of rubber goods required both for wear and warfare, and some idea will be gained of the straining weight put upon American industries by the production requirements of the World War.

Nor was the strain on the whole industrial machine lessened because it did not fall upon all parts of the machine alike or in the same degree. The exigencies of the war did not mean that the textile mills were to cease making cloth or that the clothing factories were to stop making clothes; but it did mean that the factories selected for Government work had to speed around the spindles and over the looms millions upon millions of yards of yarn and cloth of standardized qualities and uniform colors. It did mean that under the handicap of this intensified monotony these mills and factories had to compete for labor with the conspicuous "war industries" whose novelty of production and whose war wages—free at the start of the drag from commercial levels—were a powerful magnet in drawing workers from the other pursuits. It did mean that these, and other mills equally handicapped for labor, had to continue to make enough of their peace-time product to supply the needs of the civil population. In short, the war food and fabric industries,[8] as they will be referred to in this report, had to meet the strain of both war and peace production with an added handicap in the competition for labor.

On the other hand, the industries which were called upon to equip the Army and Navy with the weapons of actual warfare—called in this survey war agent and implement industries[8]—had not only to make a new and often an exclusively war-time product but they had to meet the demand for speed and quantity of output far in excess of the increased demands put upon the textile and other kindred establishments. For while an army in the field through excessive wear and wastage uses from three to eighteen times as much wearing apparel as the same number of men in civil life,[10] the rate of consumption of firearms and ammunition, powder and propellants is, in some cases, over 5,000 times greater than in peace time.[11] The

[7] America's Munitions, 1917–18, Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919, p. 466.

[8] For further definition of terms "war agent and implement industries" and "war food and fabric industries" see pp. 38–40 of this report.

[10] Based on allowances for number of principal articles of wearing apparel as given in standard budgets as compared with provisions made for soldiers in the field, shown in statement submitted by the War Department before Military Affairs Committee, December, 1917.

[11] America's Munitions, 1917–18, Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919, page 29.

uses of these things when we are not at war are limited chiefly to practice, display, and sporting purposes. In war time their deadly mission swells the demands to appalling volumes. As inevitably does it call for a corresponding production of the hundred thousand other devices required to make the missiles effective against the enemy.

None of the articles in the long array of weapons and missiles is made by hand. Each is the manifold production of cunningly devised machines, many of which were already in use for the manufacture of the instruments of peace, but thousands upon thousands of which had to be constructed especially to produce the implements of war. That the driving storm of war orders beat with tremendous force on the machine-tool industry is confirmed by the official report of the War Department, which says: [12]

> With practically all of the manufacturers of the American metal-working industries clamoring for machine tools, and with some branches of the Government commandeering the machine-tool shops in whole sections of the country, it is evident that the necessity for the heavier types of machine tools required by the manufacturers of artillery material offered a weighty problem at the outset.

Altogether the list of material requirements furnishes a complete bill of particulars as to what the World War did to industry. It also brings clearly into view the industrial setting in which women wage earners were placed by America's entrance into the conflict.

WHAT WOMEN IN AMERICAN INDUSTRIES DID FOR THE WORLD WAR.

WOMEN'S SERVICE IN WAR AGENT AND IMPLEMENT INDUSTRIES.

When the war broke out there was a seasoned, hard-drilled army of woman workers in manufacturing industries and a woman army of larger proportions in the other wage-paying activities. Necessity had long before drafted these women into the ranks of labor in factory, mill, office, and store, and had subjected them to the stern discipline of daily tasks performed under the lock-step system of modern industrial organization. This daily drill running into years made them easily available to fill the gaps created by enlistments and the military drafts and to assist in withstanding the first onrush of orders for weapons of warfare. But the most important of the industries which sprang into prominence as war agent and implement industries upon our entrance into the world conflict—the industries most wrenched and strained by the first impact of war orders—were not, except in the case of cartridge making, conspicuous employers of woman labor, though some were among the largest employers of male workers. Furthermore, so far as skilled labor was concerned, with but few exceptions, woman workers were a negligible part of the working force in industries from which the blades and bullets, the guns, grenades, and gases, and all the other implements of war were requisitioned for the battle fields of the earth, the air, and the water. The number of women in the iron and steel industry—which was foremost in the manufacture of firearms and ammunition—constituted less than 3 per cent of the working force in 1914,[13] and but little more apparently in 1916.[14] During the war, however,

[12] America's Munitions, 1917-18, Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919, p. 64.
[13] United States Census Bureau, Abstract of Census of Manufactures, 1914, pp. 531 to 543.
[14] See Table 25, p. 86.

the proportion of women after the first draft in the iron and steel plants covered by this survey was double the proportion for 1914, and more than treble after the second draft.[16]

But more striking in some ways than the rate of increase in the proportion which women constituted of the labor force is the increase in the actual numbers of women employed during the war by the war industry plants covered in this survey. The 2,124 iron and steel firms included in this survey employed over three-fourths as many women after the first draft and nearly a third again as many women after the second draft as were reported for the entire 17,862 firms included in the 1914 Census of Manufactures.[16] Plants engaged in the manufacture of airplanes and airplane parts numbered but 16 and employed but 1 woman among their 211 wage earners according to the census of 1914.[16] On the other hand 40 plants which were included in this survey and which were engaged exclusively in making planes or parts employed after the second draft 6,108 women in a total of 26,470 wage earners.[17] These do not include any plants making airplanes or parts as just one of a number of products, such as the furniture or piano factories that continued to make furniture or musical instruments while filling orders for airplane struts or propellers; or automobile plants that made also airplane engines. Nearly 1,300 plants making automobiles and automobile parts—many of them also making airplane engines during the war—reported fewer than 2,300 women workers in 1914, whereas the 163 plants included in this survey employed during "the peak load of the war" 14,402 women.[16,17] Again, 1,352 plants, representing lumber and its remanufactures in this survey, employed nearly seven-tenths as many women after the second draft as were reported by the entire 42,016 plants included in the Census of Manufactures for 1914.[16] In the 111 plants making explosives,[19] only 73 women were reported by the 1914 census, whereas the 25 plants included in this survey employed nearly 12,000 women after the second draft.[20] The total 11,021 plants covered by the 1914 census[16] as representing the entire chemical and allied products industries—of which the manufacture of explosives is but one branch—employed nearly 24,000 women, while the 737 plants representing the same industrial group in this survey employed practically the same number just before the signing of the armistice.[20] So one might go on down the list shown in the statistical section of this report and discover the importance of women through the cumulative evidence of the actual and relative numbers employed in the manufacture of implements and agents of actual combat as the war progressed and the drafts depleted the ranks of male labor and swelled the volume of war orders.

But numbers did not constitute the sole evidence of what women in industry did in the manufacture of implements for the World War. The data collected in the course of the field studies of this survey from manufacturers holding important war orders and substituting

[16] See Table 25, p. 86.
[17] See Table 9, p. 54.
[19] United States Census Bureau, Abstract of Census Manufactures, 1914, pp. 168 and 535.
[20] Table 13, p. 63.

women in places left vacant by enlisted or drafted men included written statements—some of them in the form of letters—concerning woman labor as a factor in war production. From the letters, for the publication of which permission was secured, such extracts as the following are illuminating:[21]

The president of a recording and computing machine company in Ohio states:

> In reference to the occupations in which women have replaced men the following may give you some idea of the diversity of the work. In the machine department women became expert and got out much greater production in running turret lathes, punch presses, bench lathes, milling machines, drill presses, grinding machines and engraving machines, and in addition to the operation of these machines we taught them to grind their tools, to act as job setters, and to superintend some of the departments. In the inspection department practically every inspector was a woman. In the assembly departments, as well as in the inspection departments, all were women, and they did better work and got out more production than men whom we tried on the job at various times without success. We found, too, that we could place as much, if not more, dependence in women in coming to their work and remaining on the job, which accounts for our having the lowest turnover in help in any factory ever heard of, which was less than 4 per cent per year. We taught women to inspect tools and check them over according to the drawings after they came from the tool shop, in which department women became expert. In the optical department most of the employees grinding lenses were women who were remarkably successful in the work. In the assembling of lenses we had none but women on the job, and you will find by inquiring at the Ordnance Department that our lenses and prisms were as fine as any in the world.

A member of a lumber company in Arkansas writes:

> We are also frank to say that had we not been able to secure the services of the women employed by us during the war we would have been either unable to operate at all or our operations would have been seriously curtailed.

Concerning women the chief executive in a powder-bag loading plant in New Jersey writes:

> * * * we were able to employ not less than 80 per cent women in the manufacturing operations of the plant and at one time our employees rose to a total of 6,500 people. Furthermore, we are pleased to state that the enthusiasm, patriotism and earnest endeavor of the women workers were the mainstay of this plant, and as we received an Ordnance Flag for production, the results are conclusive of the effectiveness of their work.

That these and many other letters do not report isolated cases where women played an important part in the production of war materials, but reflect a general condition, is supported by the trade-journal utterances during and since the war.[22]

The official statement of the War Department, moreover, is equally good, if not better, evidence that the great numbers of women drafted into the war agent and implement industries reflected quality as well as quantity in the service rendered. They afford the last assurance that the popular belief in the service rendered by women in these industries is not the outgrowth of sporadic or exaggerated praise—the wearying outcroppings of masculine proneness to "compliment the ladies" regardless of the facts—but is based upon a convincing record of things done by women in American industry for the World War. These utterances are the more significant because they occur in the

[21] For excerpts from these and other letters from manufacturers see Appendix A, pp. 143–152.

[22] The American Lumberman, June 29, 1918, pp. 32, 37, 53; Feb. 8, 1919. Automotive Industries, July 11, 1918, p. 71. Iron Age, Feb. 6, 1919, pp. 353–354. Machinery, April, 1918, pp. 682–687. American Machinist, Dec. 12, 1918, pp. 1066–1070. These references are but random choices from a long list of journals representing the principal war agent and implement industries.

course of a report [23] in the objective of which women's contribution to the war did not figure at all. The sole purpose of the report was to make clear the magnitude of the task confronting the War Department as a result of our entrance into the world conflict. The Assistant Secretary of War, acting as the Director of Munitions, just paused here and there in the course of his description to point out the work women did in the production of war materials. He says:[24]

> For the successful carrying out of our program for the production of vast quantities of explosives and propellants, as well as shell loading, the women of America must be given credit on account of the highly important part they took in this phase of helping to win the war. Fully 50 per cent of the number of employees in our explosive plants were women, who braved the dangers connected with this line of work, to which they had been, of course, entirely unaccustomed, but whose perils were not unknown to them.

During the discussion of the manufacture and importance of hand grenades he says:[25]

> In the production of this item 19 of every 20 workers were women. In fact, no other item in the entire ordnance field was produced so exclusively by women. Incidentally, at no time during the war was there a strike in any grenade factory.

In the course of his vivid description of gas-mask production the Director of Munitions says:[26]

> Of the 12,000 employees in this plant 8,500 were women. * * * The degree of care required in the manufacture of masks was beyond anything known in normal industry. * * * After every operation in the manufacture of the face piece there came an inspection by specially trained women set apart from the operators.

As convincing as these incidental declarations of what women in industry did for the World War are the illustrations which this official report contains and which are inserted for the purpose of showing the processes and machines involved in the production of important war materials.[27] In no case apparently were they chosen with any thought of recording the service of women in such production, yet the frequency with which women appear as operators in these illustrations is an eloquent tribute to the part they played in the manufacture of war implements and war agents.

Failures are recorded, of course, and not infrequently, as letters published in one of the appendices of this report will show and as is evidenced more clearly by the critical analysis of the results of substitution.[28] But a scrutiny of conditions surrounding the recorded failures, as shown in the detailed section of this discussion, will reveal the failures as eddies in a general drift. It will also reveal the fact that the failures were not always chargeable to the women themselves. Some were clearly due to ill-advised assignments of women to tasks without adequate instruction; others to tasks inherently unsuited to a woman's physique. Loading lumber [29] and wheeling and shoveling coal are among the occupations performed by women as a war emergency, and they do not figure conspicuously among the

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[23] America's Munitions, 1917–18. Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919.
[24] Ibid., p. 125.
[25] Ibid., p. 202.
[26] Ibid., pp. 426, 427.
[27] Ibid., Inserts opposite pp. 123, 124, 246, 247, 270, 271, 336, 337, 485.
[28] See Section III of this report.
[29] Concerning work in lumber yards one employer wrote: "For the most part the work in and around our plant is too heavy for women to perform. There were some places, however, where we could use negro women to good advantage where the work was light and a minimum of danger."

occupations in which women are recorded as making a success or among those in which women are being retained after the war. The man who announced his intention of keeping the negro women to pile lumber because "men always carry one board no matter what its weight, while women carry two if they can make it," is the exception—fortunately for the common weal.

The critical analysis of the results of substitution will show also frequent failures because of marked and obvious deficiencies in equipment and accommodations for woman workers. On the other hand it is not to be expected that among a great number of women drawn into new occupations or new industries the incompetent, the indifferent, and the incorrigible will not be present. The world's wastrels beget girls as well as boys and both make their intermittent trails through industry in war time as well as in peace time. But all of these failures combined do not offer a substantial check to the general stream of evidence of the successful services rendered by wage-earning women in the Nation's stern task of equipping its fighting forces with weapons of warfare. The failures from all causes are too few or too inconspicuous to challenge the direct testimony of the War Department or of the employers holding important war orders and making extensive use of woman labor during the war. They are not enough to overcome the evidence of service presented by the increasing numbers of women engaged in new occupations during the war. Least of all do they bulk large enough to contradict the force of evidence borne by the proportion of firms retaining women after the signing of the armistice in the occupations and industries where woman labor was employed at first only as a war emergency. As this summary is dealing only with the general drifts in the results of war-time employment of women, the failures and false starts, which were only eddies having no effect either on the direction or the momentum of the current, need be discussed in this summary of what women did in the war only as they serve to bring out the significance of the general results.

WOMEN'S SERVICE IN WAR FOOD AND FABRIC INDUSTRIES.

Concerning the service of the women in war food and fabric industries, little room remains for argument and less for intelligent doubt. Except for certain branches of food manufacture—such as flour making, which in this country passed out of the sphere of womanly activities when it became a gristmill and factory product—women constitute from a third to two-thirds of the working forces in the industries concerned with the business of clothing and feeding both the fighting and the civilian population. This fact alone would establish the importance of the service of women in these industries. But taken in connection with the fact that, as shown in the statistical section of this discussion,[30] the losses in male labor during the war were markedly heavier in these industries than the losses in other industries; that the loss of every drafted or enlisted man, not only subtracted one from the ranks of producers, but, because of the wear and waste of active warfare, added the equivalent of from 3

[30] See pp. 36–92.

to 18 to the numbers of consumers, no further data are required to complete the case for the women who remained in food and fabric industries.

But the thousands upon thousands of women who left these industries were by no means industrial deserters. Inured as they were to the noise and jar of machinery, the women in textile and hosiery mills and in other machine-equipped plants were the conspicuous first line in that army of mill and factory drilled women, previously mentioned as available labor for the establishments whose battle-field materials were exclusively machine products. In the emergency created by the shortage of male labor and the excess of orders for weapons of actual warfare, these machine-trained women in the traditional woman-employing industries were obviously the first resort of the hard-pressed war agent and implement industries.

That these factory and mill drilled women furnished liberal quotas of the needed workers to the war agent and implement industries is clearly indicated by the results of this survey. The impressive increases shown in the so-called "war industries" are marked by impressive decreases in the industries which were strongholds of woman labor before the war, and which were not popularly regarded as "war industries" at the time of our entrance into the conflict.[31] For example, 2,104 steel plants covered in this survey gained over 16,000 women after the second draft as compared with the number employed after the first draft.[32] During the same period, 1,154 spinning, weaving, and knitting plants covered by this survey lost over 10,000 women.[33] These plants lost even larger proportions of their male labor, but for this loss the military drafts and enlistments are easily chargeable in the main. The reduction of women workers, however, can be charged only to unemployment or to their absorption by other industries. Even before our entrance into the World War both man and woman labor was conspicuously scarce owing to the shutting off of immigration, to the large war orders from the allied nations, and to the resulting stimulation of activity in all industries. The columns upon columns of insistent and persuasive advertisements for woman workers in the fall of 1916 and the spring of 1917 were ample evidence that all the women who needed or wanted to work were employed. If there were no other evidence, therefore, than this survey's revelation of the upward trend of woman labor in one group of plants and the downward trend in the other, there would be small hazard in the assumption that there happened here in the early months of the war just what happened in France and England and Canada, namely, the old strongholds of woman labor yielded unwillingly but liberally to the war agent and implement industries wherein women had relatively but little foothold until the outbreak of the war. But the inference from the statistical results of the survey is sustained by definite reports from employers, who named as the source of their woman labor supply during the first months of the war such industries and wage-paying pursuits as hosiery and other textile mills, canning and packing factories, corset firms, millinery establishments, domestic service, restaurants, laundries, offices, stores, and the professions.

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[31] See Table 9, p. 54. [32] See Table 3, p. 44. [33] See Table 8, p. 49.

Still further confirmation is to be found in surveys made during the early part of 1918. The most important of these is that made by the National Industrial Conference Board—a federation of associations of employers. The conclusion of their report concerning the sources of woman labor supply in the metal trades is summed up in the declaration that the establishments had up to that time drawn their woman workers chiefly from other industrial occupations rather than from the ranks of those previously unemployed. The trend away from the old to the ranks of the new industries is also clearly reflected in the trade journals throughout the war.[35]

But as the load upon industry grew with the progress of the war and as the enlistments and the drafts continued to deplete the ranks of male producers, the women who could be drawn away from their familiar employment haunts—the spinning and weaving and winding mills, the sewing trades, the pursuits of commerce and the professions—were not enough to fill the gaps in the ranks of labor in plants whose operations were essential to the prosecution of the war.

Then began the draft of the wageless women[36]—married women, some of whom had worked for wages before marriage. Some of these answered the call for woman labor because they were pressed by the need of taking the places of brothers or husbands as family providers. Many of these did double duty, working at night or part time in factory, spending the rest of the time in family duties and required rest at home. Some of the married women went into the factories from purely patriotic motives; some were drawn by the novelty of "munitions work." Others who had followed young husbands to training camps were drawn into the war-order factories of near-by cities by the appeals from employers and by the need of sustaining or helping to sustain themselves while they stayed by until their soldiers or sailors were sent overseas.

The trade journals issued during the later months of the war confirmed the evidence developed by this survey of the growing tendency, as the war progressed, to draw upon the home for woman labor. The Factory in its issue of November, 1918, pages 831 and 832, says:

> Women as part-time workers are considered as an available source of supply of labor, since it can include many skilled workers formerly employed but lost to industry through marriage. H. Black Co. is successfully working two sets of women. Sefton Manufacturing Co., Anderson Plant, at Anderson, Ind., manufacturers of corrugated fiber board, has been successful in employing married women on bench work. These women have shorter hours and live near the factory. There are no conveniences for taking care of their children at the factory. The Thomas G. Plant Co., Boston, manufacturers of shoes, maintains a day nursery and kindergarten in connection with the factory, and after eight months feels that it has more than paid for itself. It is a great help in keeping married women at work.

Quite aside from the debatable question of policy as to the maintenance of a day nursery by a plant, this quotation clearly shows the eagerness of industry to attract married women into employment.

An article in the American Machinist[37] tells how, by advertising and organized publicity work in the local newspapers of New Haven,

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[35] National Industrial Conference Board, Wartime Employment of Women in the Metal Trades, Research Report No. 8, Boston, 1918.
[35] American Machinery, May 20, 1918; Textile World, July 21, 1917.
[36] The term "wageless" rather than "leisure" is used because most women while not "wage workers" before entering the war-order plants were by no means idle or uselessly occupied women.
[37] Solving New Haven's man-power problem," by Charles L. Edholm, American Machinist, Oct. 17, 1918, pp. 721–723.

an effort was made to tap new sources in the local supply of woman workers. The result was a 50 per cent increase in women employed in the first two weeks of the campaign and a 100 per cent increase in the first four weeks. It was necessary to make a patriotic appeal, scoring industrial slackers in order to overcome class prejudice against factory work among women. One of the features of the campaign was the pairing of part-time workers, so that they supplemented each other's work both in the plant and in their homes.

But while expressing appreciation of the help secured from the women untrained in wage-earning pursuits, over and over again the employers testified to the greater value of the "regular wage-earning woman"—the woman accustomed to earning her own living in industrial or commercial establishments—"the woman dependent upon her wages for a living." It was rare, indeed, that the manufacturer intrusted with the execution of important war orders expressed preference for the untrained woman worker over the woman accustomed to the throb of machinery and at ease in the atmosphere of factory discipline. These expressed preferences for the trained woman do not belittle the service of the untrained woman who answered the call for help. These wageless women with inadequate training met the emergency without self-sparing and with masterful determination. The preference expressed by manufacturers of war implements and war agents for the factory, mill, or business drilled woman is but the logical reliance placed upon trained, disciplined service as compared with the willing but unaccustomed service of the novice.

WHAT THE WORLD WAR DID FOR WOMEN IN INDUSTRY.

What women did for the World War is but half the question. Equally important and as far-reaching in consequences is that which the World War did to women in industry, not by the deliberate intention of those charged with the responsibility of equipping the fighting forces but by the accident of discovery made in a search for an emergency labor supply. After the second draft women were substituted in men's places by thousands, frankly as a "war emergency." Production had to be maintained by adding to the ranks of industry as surely as the forces of the Army and Navy had to be swelled by depleting the ranks of industry. When labor had to be secured of whatever sort available, it might have been that by the very force of numbers women could have filled and held successfully the gaps cut in the ranks of labor by the drafts and enlistments. If women had helped to win the war by this method alone, the cost of their service would be reckoned not only in the strain which the conflict put upon the health of women in industry but also in the depressing influence which such an ineffaceable war record would have exerted upon the life and labor of the wage-earning woman. If women had held their own during the war by this method only, then that record would reveal her individual failure in spite of the collective success of massed woman labor as an emergency substitute for drafted and enlisted male labor. If such had been her war record, then not only would it have sent her back to her prewar status as soon as men were available, but it would have kept her in the ruts already worn deep by woman labor and challenged her every effort at progress for years to come unless another emergency arose. It would have

stamped as proved that which previous to the war had been almost universally assumed, namely, that women were available for but small service in industry and could render that service in constricted spheres only. As the field of industry is enlarging, a record of demonstrated failure to maintain the level of industrial efficiency under reasonable conditions would necessarily have sent women to their old employments or into their homes, wearing the scar of failure that could not long have been concealed by the flush of pride in having served the Nation as a makeshift during the war. If true, that would indeed have been a serious and far-reaching consequence of the World War. For the purpose of this summary certain salient facts, based on the figures set forth in the statistical section of this report, may be pointed out which indicate the success of the introduction of women into industry.

EFFECT OF THE WAR ON WOMEN IN THE OLDER INDUSTRIES.

In the first place, the heavy draft which the war agent and implement industries made upon factory and mill drilled women had the immediate effect of relieving somewhat the congestion in the traditional woman-employing industries where over 75 per cent of all women in the business of manufacture were concentrated before the World War.[38] Of course only the current of succeeding censuses will show just to what extent the wrench given industry by the World War has permanently loosened the grip which the textile and sewing trades have hitherto held upon woman labor. But the results of this survey disclose some important immediate effects and furnish, on the whole, strong evidence of the trend in permanent results.

The time and money allotted for this survey would not permit an intensive study of wage scales in industries either old or new to women. Recently published reports, however, by the National Industrial Conference Board[39] and by the United States Bureau of Labor Statistics shed a flood of light on the subject. They reveal a sharp rise in the wage levels during the war, corresponding very closely with the wages in what were popularly regarded as "war industries." While the drop in women's wages in the "women's industries" was greater after the war than the drop in the other industries, the level was well above the level of 1916. Of course, men's wages increased in similar proportion during this period in both groups of industries.

The status of woman labor supply in the traditional woman-employing industries was further revealed in the comments made by employers nine months after the signing of the armistice to agents of this survey. The burden of all this comment, practically without exception, was the difficulty of getting former woman employees back. "We have gotten some back, but they have been spoiled by war wages." "We can't get our women back at the old wages." "We have to be content with a poorer grade of service, because our former women workers are sticking to their war jobs." The trade journals early reflected the growing anxiety in the so-called "women's industries" over the effect of labor competition created by the demands of the war. The Textile World Journal, for example, said:

[38] See Table 2, p. 40, of this report.
[39] War-time changes in wages. National Industrial Conference Board. Research Report No. 20, Boston, 1919.

"Women have been able to do such good work in new occupations that they will likely remain 'on the job' even after normal conditions as to labor supply have been restored." This article goes on to say that women may be regarded as fixtures in the machine shops and foundries, and that with offers such as they are getting from other industries the textile and the garment trades can no longer have a monopoly of female labor. The wages offered in the new occupations will be an inducement to them to desert the old industries where they have special qualifications. Skilled weavers are more apt to remain fixed in the trade, but this is not so true of spinners and workers on knit goods. Only by good wages, sanitation, and welfare equipment can the probable loss of female labor by the textile industries be overcome, in the opinion of this writer. Moreover, "competition for labor is not a temporary condition, because industrial development is the order of the day."[40] All the comment vibrates with the influence which the trend of woman labor, shown by figures collected in this survey, has exerted upon the wages of women remaining in these traditional woman-employing industries.

THE OPPORTUNITY WHICH THE WORLD WAR BROUGHT TO WOMEN.

The second and most important consequence of the war to women was the fact that the call of the war to men was the call of opportunity to women to try themselves out in a new kind of service. While women in industry were serving the Nation in war, they were demonstrating to themselves, to industry, and to the public to what extent, if at all, they were capable of serving in wider fields of industrial responsibility in time of peace. At this point it is essential to make very clear just what the opportunity was which the war brought to woman wage earners. While it is true, as stated before, that women were an inconsiderable proportion before the war of the working forces of the iron and steel and other industries which became the producers of implements and agents of warfare, it can not be said that the World War opened all of these industries to women. Although the relative number of women was insignificant in the prewar period, the actual numbers mounted into the thousands in some of these activities. Women were employed in the metal factories long before the war. They have been at work in the core rooms of foundries for many years; and have fed automatic presses in cartridge, hardware, brassware, tin can, and other metal manufactures. They have operated automatic machines on needles and pins and jewelry, have used small drills, and tended power screw drivers on rifles and pistols, on typewriters and sewing machine parts—all before the war. They varnished and lacquered; they wrapped and packed and labeled years ago in industries whose output was essentially the product of skilled male labor. The war can not be said to have opened these industries to women. But it did a more important thing in that it forced the experiment of woman labor in the craftsmanly occupations in many of these industries where the woman worker had made little headway during all the years of her presence there, because she had been pocketed, so to speak, in the minor or in the specialized

[40] Increasing Competition for Female Labor, by G. D. Crain, jr. Textile World Journal, July 21, 1917, p. 84.

and standardized processes of manufacture. The machine, set for her to stamp, to punch, to drill, even to cut or grind at a certain point, was the extent of her opportunity to serve in the metal factories before the war.

Of course the war resulted in the rapid expansion in the volume of woman labor in these well-known repetitive occupations, as it did in the unskilled and laboring jobs. The preponderance of reports showing the success of women as substitutes for semiskilled male labor where muscular strength was not a factor was to be expected and is significant chiefly as indicating a further breaking down of the industrial tradition that has held women so largely in the spinning, weaving and sewing trades. Of vastly greater importance, however, is the fact that the emergency created by the shortage of labor cleared the woman worker's way in certain important industries to the "master machines" and brought to her hand the "key" occupations that control entrance to desirable positions in many industries. It gave her a chance to be tried out as a responsible member of the forces of constructive skill. In the iron and steel and other metal industries, for example, it opened to her the machine shop and the tool rooms and introduced her—though in limited numbers—into the steelworks and rolling mills. Instead of "tending" or "tripping" or "feeding work," measured and marked for her, into a machine especially adjusted or constructed to perform a specialized or standardized process, the emergency created by the war forced the experiment of teaching the woman worker to read blue prints, to understand the characters of different metals, to grasp the purposes and capabilities of various machine tools, to adjust their mechanism, to set up, to measure and to mark her own work and be responsible for its quality as well as for its quantity. In certain other industries, too, pressed hard by the shortage of labor and the demands of the war women were given a trial in occupations requiring judgment, precision, and decision.[41]

The drafts upon woman labor for these master occupations were not heavy, it is true, because this country had not been involved in the war long enough to necessitate heavy drafts and because we had learned from Europe the wisdom of making "haste slowly" in the business of drawing skilled labor from important industries.[42] The critical analysis of the results of substitution to be found in the detailed section of this discussion shows clearly, too, that in a number of industries the employment of women did not extend much beyond purely repetitive occupations or occupations equally unexacting in the matter of skill.[41]

The chemical industry, however, had reached the stage of labor shortage in June, 1918, which compelled the organization of a campaign—backed by the Chemical Service Section of the Army—to get 1,600 trained women chemists to take the place of men drafted from important chemical plants. For these positions "real" chemists were wanted, according to the official call. But the evidence from the reports collected in August, 1919, indicates that the armistice was signed before this campaign had a chance to yield material results; that women in the chemical industries, with few exceptions, had not gone much beyond routine analysis work; and that the great majority

[41] See Section III of this report.

[42] Table 3, page 44, shows a gain of 5.2 per cent in male labor after the second draft in 2,104 iron and steel plants.

were doing work requiring less skill than is required of the routine analyst.[43]

On the other hand, enough plants in other industries were forced to try out women in skilled and responsible occupations to make the results of the experiment of singular consequence to the permanent status of women in industry. To avoid misunderstanding or confusion, let it be said again that the burden of comment rests on the effect of employing women in new and skilled occupations, on her progress or retrogression, in industry. Did she handle the metal and run the machines requiring skill in such a way when making guns and shells and grenades during the war as to make her an obvious labor asset in the use of both when they were turned again to the manufacture of locomotives, farm tractors, cash registers, and other instruments of peaceful commerce? Did she make airplane parts, cavalry equipment, sounding and sighting devices for war purposes in such manner that firms employing her purely as a war emergency are retaining her for the manufacture of peace-time products whose labor costs must meet the tests of sharp competition in the world's commercial markets?

For answer to these questions certain essential facts arrest the attention. The most important industries in which experiments in the use of woman labor in skilled work were made were the iron and steel and other metal industries, but the machines which women operated in these industries during the war are used also in many plants concerned with other lines of manufacture, such as optical goods, scientific instruments, automobiles and automobile parts, motor cycles, musical instruments, airplanes and kindred products. The success or failure of women on a given machine or in a special occupation, therefore, exerted a more or less direct influence in all the industries to which the operation of that machine or the performance of that occupation was common. As a consequence, the importance of the industry in which substitution in skilled occupations occurred is overshadowed by the importance of the occupation itself, since the occupation is the channel along which the progress of women from industry to industry is advanced or blocked. In other words, the craft and not the industry is the line by which to trace the effect of war-time employment of women in skilled or responsible positions.

In this connection it should be remembered that the machine crafts and other crafts in which women were employed as skilled workers are highly organized; that while women are usually not debarred officially—are, in fact, often formally declared eligible to membership—the real attitude toward the admission of women has been one of indifference generally and the attitude toward the extension of woman labor in skilled crafts has often been one of positive hostility.[44] There were some conspicuous exceptions, particularly during the war, but the significant fact is that they were exceptions. Some of these labor organizations require a long apprenticeship. For example, the constitution and by-laws of the International Association of Machinists, which admits women to membership, provides that "any boy engaging himself to learn the trade of machinist must serve four years."

[43] See pp. 121–128 of this report.

[44] For detailed statement concerning policies of organized labor affecting the employment of women see Appendix B, pp. 153–158.

Assuming that the use of the word "boy" does not bar girls, the actual fact is that at the time when the shortage in skilled machine labor suddenly developed to its acute stage an insignificant number of women had served any such apprenticeship in point of time on the required range of machines or in the stipulated occupations. For the qualifications of a machinist as laid down by the above-named organization involve among other things a "fundamental knowledge of shaping, sizing, turning, boring or fitting metal parts of machinery of any character, whether said metal be steel, brass, lead, copper, aluminum, or bronze, or any substitute used therefor."[15] It also accords the status of machinist to "any person who may have worked at the trade four years, either as vise hand, lathe hand, planer hand, slotting-machine hand, milling-machine hand, horizontal or vertical boring-mill hand, screw-machine hand, operators of Gisholt, Jones & Lamson, and all other turret lathes, and of gear cutters, floor hand, or of general erector of machinery."[15] An apprenticeship of four years would have precluded the development of full-fledged woman machinists during our participation in the war.

Furthermore, when the emergency forced the employment of women as operators of the machines named in the foregoing quotations, the private and public training institutions of the country had turned out but an insignificant number of women with mechanical training. The plans which did get under way for training women were not started early enough to produce material results before the signing of the armistice. Such training as women got for their emergency work, therefore, had to be given chiefly by firms making the experiment of employing women on skill-exacting work. In the full light of these circumstances one should read the analysis of reports from 562 firms selected for intensive questioning from over 3,500 firms reporting substitutions. These reports reveal the results of substituting 58,717 women during and since the war.[16] Only in the light of the specific conditions under which the employment of women in skilled occupations occurred will an intelligent understanding of their success or failure be attained. For example, among the occupations in which a number of failures in experiments with women were reported are lathe operators. The lathe, in a way, is the "parent" or key machine in a regulation machine shop. It can be set to do the work that almost all of the well-known specialized machines can do. Its operation, however, involves more care and more attention than the operation of the specialized machines. Manifestly it requires the mechanical grasp involved in the successful operation of all the machines that have been constructed, each to speed a single process of which the lathe is capable, but which can be done in most cases on specialized machines by the use of less skilled labor than the lathe usually requires.

There are operations on other machines which constitute notable exceptions, as they require more skill than work on the lathe or at least as much. But on the whole the mastery of the lathe involves a basic knowledge of, and adaptability to, the use of machine tools. Furthermore, there are lathes of varying types and sizes on which metal articles of such wide range in size and weight are fashioned

[15] Constitution and by-laws International Association of Machinists, effective Apr. 1, 1918. Appendix B, p. 157.

[16] Table 29, p. 94.

that methods of bringing work in contact with machines vary from easy, hand manipulation, through more or less muscular effort, to mechanical lifting devices where the metals are too heavy for either woman or man to lift. When the material handled made muscular strength an important factor in the successful operation of the lathe, women usually failed. When the material was so small as to make the weight unimportant or so great as to be beyond the strength of either man or woman and to render mechanical lifting devices necessary, the question of success was then reduced to one of comparative skill. In view of these facts and in view of the lack of facilities for training at the outbreak of the war, it is significant that although considerable proportion of failures resulted from experiments with women lathe operators, still over two-thirds of the firms making this experiment, and reporting on the subject, recorded the output of women's lathe work as equal to or better than men's; and that more than half of the firms reporting kept women as lathe operators after the signing of the armistice. On other machines requiring a high degree of skill the results were approximately the same—frequently better. The least favorable report both with regard to output and retention after the war was on the women crane operators, although even here, four of the seven firms reporting recorded the results equal to or better than the work of men. It is also significant that with the exception of crane operators where three 8-hour shifts of women were employed in place of two 12-hour shifts of men, and that of women riveters all firms reported from 98 to 100 men displaced for every 100 women employed. This was evidence that the results were not due to the employment of "three women to do the work of one man or two men," as has frequently been said. The good faith of these reports is further evidenced by the fact that with the exception of the crane operators, from 50 per cent to 86 per cent of the firms reporting were retaining women operators in each of the occupations studied.[47] However, the full significance of these figures is found in the statements of employers showing the extent to which women using these machines did their own "setting up" and grinding of tools. On lathes, millers, drills, grinders, and presses women set up work of varying kinds in almost every metal industry. That such work was intrusted to them carries a meaning that commands the attention of those actively interested in securing equal opportunity for women dependent on wages for a livelihood. Further significance lies in the fact, as explained before, that these metal working occupations are not confined to any one industry, but run through a wide range of industrial activity.

What is of equal importance is that the principles involved in the operation of these metal-working machines are the same as those involved in operation of many machines constructed to do kindred processes on other materials.

As for the employment of women in skilled occupations other than the responsible operation of machines in metal-working industries, a study of the critical analysis will show conditions and results closely parallel to those attending the employment of woman

[47] Table 31, p. 96.

labor on skill-exacting machines. Speaking of the work of women substitutes, the president of a large furniture manufacturing company says:

> After the completion of the war contracts we were naturally anxious to get back into our regular line. * * * Skilled labor being scarce, we distributed these women (who had been substituted on exacting work as is shown by the full letter published in Appendix A[48]) throughout our factory and we now (October, 1919) have women in all our departments, viz: machine, cabinet working, finishing, upholstering, trimming, etc., and all making good and a big asset to our organization. We believe that there is hardly a line of work in which a woman can not adapt herself if the right type is selected for the various lines.

Over 77 per cent of the 562 firms intensively questioned reported satisfactory results from the experiment in the employment of woman labor. On the whole there is no room for reasonable doubt that the opportunity thrown open to women by the war resulted in a clear demonstration of their capability and availability for service in skilled crafts.

At this point attention should be called to the contention that the drafts and enlistments had left in the ranks of labor the least fit physically and therefore the least efficient industrially. Unquestionably this was true of unskilled and semiskilled labor. There is grave doubt as to its application—or at least to the extent of its application—to skilled labor in view of the policy of exempting as far as possible skilled men in important war industries. It is, indeed, a question as to whether exemption of the most skilled men in occupations in which women had not yet been substituted would not leave these women in competition, not with the least efficient industrially but with the most efficient.

Finally, after the war, the reduction of the labor force—both men and women—and the relative number of women retained in the new industries and new crafts should be interpreted with close reference to the source of the woman labor supply during the war and the high tension in productive activity. To meet the requirements of war orders, double and sometimes triple shifts were maintained. At the signing of the armistice these shifts, when they had been introduced as a war necessity, were reduced to one shift. The labor forces as a whole in 1,012 plants in four leading war agent and implement industries included in this survey were cut over 40 per cent by August, 1919. In other words, the large reduction in labor force as a whole should not be taken as due altogether to complete shutdowns but frequently as showing curtailment of double and triple shift work. Particularly was this so in cases where married and other wageless women had been induced to work part time or on night shifts. It is to be expected, therefore, that while the total labor force in plants included in this survey was reduced about 40 per cent nine months after the signing of the armistice, 62 out of every 100 men, as against 43 out of every 100 women, remained in the plants.[49] The number of women not regular wageworkers who went back to their homes after the war would in itself account for a considerable part of the difference in the proportion of reductions. This seems probable, moreover, from the figures[50] taken from the United States Employment Service records, for domestic service, and especially from personal interviews with employers in

[48] See letters from employers, Appendix A, pp. 143-152. [49] See Table 27, p. 90. [50] See Table 28, p. 92.

nonwar industry plants. All the factors combined, however, did not exert sufficient influence to reduce the proportion of women in the new industries to prewar levels. On the contrary the figures indicate that the proportion is in some cases more than double that shown by the 1914 Census of Manufactures or by the reports from nearly 9,000 firms reporting for 1916.[51] That the relative reductions in the numbers of men and women workers and the permanent gains made by women over the prewar period fairly represent prevailing conditions is supported by the drift of comment in trade journals after the war. J. E. Schipper, writing in the Automotive Industries for January 30, 1919, on "Women can handle exacting work," says:

> A large number of concerns laid off men as well as women upon the termination of the contract before swinging back into normal manufacture. The temporary lull will compel the employment of returned soldiers in preference to women but when reconstruction hits its pace the temporary surplus of women will be reabsorbed. * * * The numbers have decreased temporarily during the past few months, but every one of the women so employed will soon find a job awaiting her in time of peace. * * * One of the lessons from the war has been to show that women can do exacting work.

Conditions confronting industry following the war are so changed, and changed in such phases as to render a retention and extension of woman labor in skilled crafts more than probable. Millions of the men of Europe were killed in the war. The productivity of millions of others was sharply reduced by varying degrees of disability. The demands upon our own industries for reconstruction and development of permanent foreign markets and the growing requirements of domestic markets, together with the factors operating to reduce the normal supply of immigrant labor, will soon force the American manufacturers to develop further the latent labor possibilities revealed by the war-time experience in the employment of women in skill-exacting work.

It is fairly clear that industry is already making use of this woman labor supply to a marked extent, as shown by the figures set forth in the statistical section of this survey.

CONDITIONS UNDER WHICH WOMEN ARE BEING RETAINED IN NEW OCCUPATIONS.

Under just what conditions are women remaining in the new crafts and the new industries? The answer to the question is not academic. It is fraught with vital significance to the women workers, to industry, and to the public.

In the first place none of the changes in labor conditions following the war is likely to correct the inequalities in relative rates of pay which prevailed during the war. If anything the inequalities, without a counter influence, may tend to increase.

On the other hand, reports from employers indicate a tendency to make increasing adjustments in factory accommodations both for the women already employed and for contemplated enlargements of the woman labor force. More important than improvements in factory accommodations are the adjustments that are being made in equipment. Some of these adjustments are made apparently as a result of the lesson taught by the war and discussed in the foregoing pages, namely, that women operated successfully small machines requiring

[51] See Table 1, p. 35, and Table 25, p. 86.

skill but little or no muscular strength; and the very large machines to handle the material for which necessitated the use of lifting devices for either men or women. But when machines unequipped with lifting devices required the handling of material too heavy for a woman but within a man's strength, the woman usually failed where the man succeeded. Lifting devices and fastening devices on more of the machines calling for the handling of materials of intermediate weights shorten the gap in the range of machines in which women are not available because of limited physical strength.

Equipment for comfort and standards of working conditions have been largely determined by laws enacted by State legislation. This investigation did not aim to throw light on the effect of labor legislation. It is noteworthy, however, that in the list of occupations [52] in which women have taken the place of men State legislation was found to debar women from only two occupations—in core making, where in a few States the maximum weight to be lifted is designated, and in the operation of grinding and polishing machines. The latter operation affects the work women are doing not in one industry alone but in all industries in which grinding must be done.

The difference between the laws of different States as to the maximum weight which women employed in core making may lift shows that we have as yet no scientific basis for accurate determination on this point. Ohio and Pennsylvania set a limit of 15 pounds as compared with 25 pounds in New York and 40 in Massachusetts. Scientific tests are needed as a basis for such legislation. It need hardly be added that the difference in muscular strength between men and women and the greater danger of strain on vital organs for women form the basis for regulations of this kind as to the lifting of weights.

The prohibition of the employment of women on grinding and polishing machines is different in character, since it has been proved to be possible to have a device which will draw off the dust so that the operator will not breathe it. Moreover, the danger to the lungs is as great for men as for women, and for the protection of all workers exhaust systems of this kind should be required. It is unfortunately true that it is easier to secure a guard for a machine to prevent an accident than to compel the drawing off of dust to prevent tuberculosis, for the reason that workmen's compensation laws require the payment of money to the employee who meets with an accident, but as yet compensation for disease caused by the work is not required, except in a very few States.[53] In the interest of the health of both men and women, safeguards against industrial diseases should be more effectively demanded. When these are secured it will be found unnecessary to prohibit the employment of women. This form of prohibition, however, has never applied to more than one or two occupations, and is certainly not desirable as compared with a more comprehensive protection of health for all workers.

In this connection it is significant that the punch presses—the operation of which ordinarily requires little or no skill, and which have been operated for years by women in the metal-working factories—are really dangerous machines when not properly guarded, and guard-

[52] See pp. 137–142.

[53] These States are California, Connecticut, Massachusetts, North Dakota, and Wisconsin; Hawaii and the Federal Government also include occupational diseases in their compensation laws. (Data furnished by the U. S. Bureau of Labor Statistics is up to June 28, 1920.)

ing them effectively without making the device unavailable for certain types of work is a difficult matter. Yet from the operation of this machine women are not debarred, while on other machines, some of them requiring skill, certain States forbid the employment of women. It is inevitable that inconsistencies of this kind are producing results not intended by the promoters of industrial betterment.

The attitude taken by the First International Congress of Working Women which met in Washington in October and November, 1919, is of interest in connection with a discussion of women's employment in hazardous occupations. In the resolutions passed by that representative body of working women from 19 different countries, the section on hazardous occupations urged the "prohibition of the employment of women only in trades which can not be made healthy for women as potential mothers."

Second in importance only to the physical conditions and mechanical equipment provided for women retained in the new crafts and industries are the facilities for training which will be accessible to women entering the ranks of wage earners.

It requires no stress of argument to make clear that training schools, even of very limited scope, can not be maintained profitably under normal conditions by any but large firms. The exigencies of the war in many cases compelled many firms of comparatively small peace-time operations to provide training for the women taken on during the war as substitutes for men. The congestion of war orders—and the prices usually paid for the work—warranted the expenditure. Most of these smaller firms discontinued the too expensive training activities at the close of the war.

It is obvious, furthermore, that the training offered by such of the large firms as are continuing their training facilities for women will be, in peace time as it was in war time, adapted with special reference to the output requirements of each firm's own plant. Although public and private vocational institutions started the training of women for mechanical occupations during the war, the signing of the armistice marked the close of much, if not most, of this activity. The stress of the training is now as in prewar times upon the sewing trades and in domestic science. As one vocational training officer writes:

> All of the States have supervisors of home economics into whose hands they consign the entire work for women without question, because they say she will ultimately end in the home, and with that statement they relieve their conscience of any responsibility to her as a wage earner.

The attitude of the trade organizations in the crafts which women have newly entered also has an important bearing on the work which women have done and will do in these industries. As previously stated, these crafts in some cases are highly organized so far as the men are concerned, and the unions have well-defined standards of working conditions. Among approximately 400,000 members of the machinists' union, for example, there were only about 12,500 women at the end of 1918. During the war women having a month's experience were eligible to union membership according to their classification. According to a high official most of these women were inspectors and machine tenders; very few were skilled. This official said, furthermore, that while the final reports were not complete "the evidence

pointed to a large reduction of women members after the signing of the armistice."

The molders' union did not admit women even during the war to membership and the bars are still up against them. By the rules of this organization members are fined for teaching a woman any part of a trade. One of the reasons prompting the molders in their attitude toward the admission of women is much the same as that which prompts legislation prohibiting a hazardous occupation for women instead of trying to make it safe for them. A further reason is the fact that core making—the common occupation performed by women in foundries—is regarded as one of the stages in the apprenticeship of a "molder." Unless all the stages of apprenticeship are open to women the introduction of woman core makers complicates and disrupts trade regulations.[54]

The impression should not be left, however, that the end of the war has found women retrogressing or even standing still in the trade-union movement in America. The International Congress of Working Women from many countries of the world was called in Washington about a year after the signing of the armistice on the initiative of American women in the trade-union movement. This fact alone, coupled with the effective work of the congress, indicates a live appreciation of the pressing issues before the working women of the world by the working women of America. Furthermore, recent years have seen steady progress in the organization of women in their traditional occupations in clothing shop, cigar factory, textile mill, and the like, and a gradual breaking down of many of the prejudices against women members on the part of unions in trades which women have recently entered.

SUMMARY OF SALIENT FACTS DISCLOSED BY THE SURVEY.

The salient facts disclosed by this survey can be summarized in five brief paragraphs.

First. The popular belief that women in industry rendered real service to the Nation during the war is sustained by the figures showing the numbers of women employed both in war agent and implement industries and in war food and fabric industries, by the preponderence of evidence from employers holding important Government contracts, and by the official statement of the Assistant Secretary of War, acting as Director of Munitions.

Second. The labor shortage and excessive demands on industries essential to the production of implements and agents of warfare resulted during the war in—

(*a*) A sharp increase in the number of woman workers in these industries during the war.

(*b*) A marked decrease in the number of women in the traditional woman-employing industries, resulting in a relief of the long standing congestion of woman labor in these pursuits and in part contributing to a marked increase in the wage scales of the women remaining in these industries.

(*c*) The employment of woman labor in other skilled crafts from which women had been practically debarred before the war.

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[54] See .pp 107–109 of this report.

Third. When the managers of private, Government, and Government-controlled plants were confronted with the necessity of employing women in skill-exacting positions there were practically no trained women available, because—

(*a*) Public and private vocational institutions had given little encouragement to the training of women in mechanical occupations.

(*b*) Organized labor policies in fact—although not always in official regulations—discouraged apprentice work for women in skilled occupations.

Fourth. The training of women employed in skilled occupations during the war was provided principally by the employing firms.

Fifth. The success attending the emergency employment of women in occupations requiring a high degree of skill and the expansion of commercial trade, has resulted in the retention of women in most of these crafts and industries since the close of the war and bids fair to encourage a larger use of woman labor in the future.

The changes taking place from 1914 to 1919 in the proportions of woman employees in the leading war agent and implement industries are shown in the following summary table:

TABLE 1.—PROPORTION OF WOMEN ON LABOR FORCE OF LEADING WAR AGENT AND IMPLEMENT INDUSTRIES BEFORE, DURING, AND AFTER THE WAR.[1]

Industry.[2]	Women per 1,000 wage earners.				
	1914	1916	After first draft.[3]	After second draft.[3]	1919[3]
Iron and steel and their products	29	33	61	95	94
Lumber and its remanufactures	21	40	46	94	68
Cars, steam and electric railroad, and railroad repair shops	2	2	29	55	16
Stone, clay, and glass products	39	59	115	155	154
Leather and its finished products	277	304	307	330	263
Chemicals and allied products	85	79	98	142	85
Metal and metal products, other than iron and steel	150	148	149	178	191
Automobiles, including bodies and parts	18	21	44	114	43
Electrical machinery, apparatus, and supplies	202	175	214	270	173
Rubber goods	205	187	277	354	116
Carriages, wagons, and materials	15	15	22	45	2
Agricultural implements	10	18	15	43	37
Musical instruments	77	81	165	260	246
Shipbuilding, including boat-building	2	1	6	7	2
Optical goods	265	154	327	371	251
Motion picture and photographic apparatus and supplies	278	277	303	351	347
Instruments, scientific and professional	156	152	145	171	135
Motor cycles, bicycles, and parts	20	77	66	98	91
Airplanes, seaplanes, and parts	5	36	155	186	88
Total	65	77	106	139	100

[1] For more detailed figures and source of data, see Table 25, p. 86.

[2] Industries are arranged in order of importance according to the Census of Manufactures, 1914.

[3] "After first draft" indicates a period 7 to 8 months after the first draft in February-March, 1918; "after second draft" refers to a period 4 to 5 months after the second draft in October-November, 1918; and 1919 refers to August, 1919, 9 months after the signing of the armistice.

SECTION II.

STATISTICS OF WOMEN'S INDUSTRIAL EMPLOYMENT DURING AND AFTER THE WAR.

SCOPE AND METHOD OF INVESTIGATION.

This report covers data on the employment of women in the manufacturing and mechanical departments of all the principal peace and war time industries. Women in clerical and mercantile occupations and in steam and electric railway transportation, as well as women in technical and professional pursuits were not included in the survey. Even if the facts about women in mercantile and clerical pursuits had been included in the mass of war-time data available for this study, which was not the case, the factors involved in their extended employment as a result of the war differed enough from those involved in the expansion of woman labor in manufacturing and mechanical occupations to necessitate a different method of presentation. This was true to an even greater extent of the women in technical and professional occupations.

Furthermore, the employment of women during the war and since the signing of the armistice on steam railroads is comprehensively covered by the official publications of the United States Railroad Administration,[1] while women employed on street railways during the war have been the subject of special investigation by the Women's Bureau in the United States Department of Labor.[2] Neither of these groups of women is engaged in producing industries, though the requirements and compensations attaching to many of the occupations are such as to have made it easily possible to add them to the groups included in a survey of women in producing industries. Under the circumstances, however, the duplication did not seem justified which would have resulted from including in this one survey with women in manufacturing industries the women employed on steam and electric railroads.

SOURCE OF DATA.

Prewar data pertinent to this survey were made available through the War Industries Board and through the National League for Women's Service, which worked during the war in official cooperation with the Government. Though much of the information in the hands of these two agencies was of a confidential nature, it was possible to make certain general facts available without in any way violating official confidences. The prewar data secured from these official bodies show the number of men and women employed during the summer and fall of 1916, the departments in which women were employed and the departments in which women could be employed

[1] U. S. Railroad Administration, Women's Service Section, Number of Women Employed and the Character of Their Employment. (Class I Railroads), Washington, 1919. *Also*, Annual Report of Walker D. Hines, Director General of Railroads, Washington, 1919, pp. 59–80.

[2] United States Department of Labor, Women's Bureau Bulletin No. 11, Women Street Car Conductors and Ticket Agents, Washington, 1920.

in the event of an emergency. Because of the limitation in time and resources for this survey, only the numbers of men and women employed in the industrial departments during 1916 were used in this report. The reports were made by nearly 9,000 firms representing all leading industries and employing over 3,000,000 wage earners.[3]

War-time information furnished by these same two agencies shows the number of men and the number of women employed after the first and after the second draft, the number of firms substituting women for men, the number of women substituted and the number of firms increasing the woman labor force without substitution. These data include reports from nearly 15,000 firms representing all leading industries and employing nearly 2,500,000 wage earners.[4] The United States Employment Service also made available its unpublished records of the registrations and placements during the war of men and women workers in every State in the Union, and further furnished postwar data showing registration and placements in the 48 States after the signing of the armistice.[5] Figures from leading industrial States only were statistically collated, however.

Such records were supplemented by an intensive analysis of substitution based on data secured directly through personal interviews by field agents engaged in this survey. In this particular study 562 of the 3,558 firms reporting substitutions during the war were visited.[6] Establishments were selected for field work in those industries and those localities in which the available war-time data revealed the greatest substitution of women workers for men. The field agents also secured data on the retention of women employed nine months after the armistice in plants in which substitution had occurred during the war.

To balance this postwar data secured from plants substituting women questionnaires to the number of 1,600 were sent to firms either not substituting women or not employing women at all during the war. A proportionate number of plants in each of these two classes was chosen, and more than 1,300 of the 1,600 questionnaires were filled out and returned.[3] In this way a fair estimate was secured of the relative number of men and women employed after the war in the industries as a whole, without any misleading inference deduced from figures from those plants only in which special efforts had been put forward to introduce women. These questionnaires called for the number of men and women wage earners employed nine months before our entrance into the war and nine months after the signing of the armistice.

As the purpose in making a critical study of the results of substitution was to determine the extent to which the war-time employment of women had opened to women new occupations and new industries, field investigation of substitution in the textile and other women's industries was not undertaken, except where the product of these industries was of a distinctly war nature or closely associated with the manufacture of weapons of offense or defense. These industries have been and still are strongholds of woman labor. For

[3] See Table 25, p. 86.
[4] See Tables 9-24.
[5] See Table 28, p. 92.
[6] See Section III of this report.

example, among the more than 3,300 textile firms included in this survey, only 23 reported no women, and in most cases this was due to a temporary suspension of regular operations. The per cent of firms employing women in the food, shoe, and glove industries was 90, 98, and 100, respectively. As over 75 per cent of all the women employed in manufacturing industries listed in the 1914 Census of Manufactures were engaged in making textiles, wearing apparel, food, and tobacco products, not much was left for the war to do in the way of opening these industries to women.[8] The question of importance to be answered was the extent to which the war deflected from these occupations the current of woman labor which hitherto had flowed with the momentum of tradition into the factories and mills concerned with woman's world-old work of clothing and feeding the Nation. Whether the trend of woman workers during the war was toward or away from the traditional strongholds of woman labor is shown by the war-time data as summarized for these industries in Tables 2 to 7.

These figures are supplemented by a series of detailed tables showing changes in the labor force of both men and women, the extent of substitution of women on men's work during the war, and the increase in the force of women without substitution.[9] These facts are given for some 33 leading industries producing for the war, and cover a wide range of occupations, new to women, or traditionally theirs. For the leading industries the information is shown for their various branches or subdivisions, also for three large basic industries by States. It has been thought in presenting this material in detail that it would be available in this form to students of the subject for further analyses of the course of women's employment during the war than have been made in this report.

Some light is thrown upon the extent to which the current of woman's labor returned to its accustomed channels after the war by Table 28, which summarizes the data from unpublished records of the United States Employment Service, showing the applications for jobs and calls for woman workers in these industries before and after the signing of the armistice. These records are supported by the reports of employers already referred to, on the effect of the war on the status of the woman-labor market after the signing of the armistice in the industries which before the war monopolized the woman-labor supply.

Data showing the attitude of organized labor toward the admission of women to membership in unions representing occupations into which women were introduced as a war emergency consist of definite utterances by the officers of unions concerned, or of quotations from the latest copies of their constitutions and by-laws.[10]

WAR AGENT AND IMPLEMENT INDUSTRIES AND WAR FOOD AND FABRIC INDUSTRIES.

Using as a basis the official report of the Assistant Secretary of War made as Director of Munitions and submitted to the Secretary of War under the title "America's Munitions 1917–18," the industries represented in this survey of approximately 15,000 firms have been divided into those producing combat and defense materials or their

[8] See Table 2, p. 40. [9] See Tables 9 to 25. [10] See Appendix B, pp 153–158..

operating equipment, and those providing the personal necessities of the fighting forces. Within these two classes the classifications of the United States Census of Manufactures, 1914, have been followed both as to terminology and grouping. In the first group are those industries diverted from their accustomed peace-time product to the manufacture of guns of all sorts and sizes, including motive equipment; rifles, pistols, and small-arms ammunition; explosives, propellants, and acids required for chemical warfare; airplanes, airplane engines, parts, and other equipment, including radio, telephone, and photographic supplies; balloon and balloon equipment; electrical apparatus and supplies; gas-defense equipment; surgical appliances; ships and boats; steam and electric cars; automobiles, including bodies and parts; and materials and machine tools for making these implements and agents. Most of these industries were so conspicuous as "war industries" throughout the war as to obscure the importance of the textile and textile products and other industries essential to the winning of the war and the maintenance of the civilian population. As pointed out in the first section of this report the textile mills and clothing factories, the boot and shoe plants, and the establishments concerned with the manufacture and preparation of food were as indispensable to the winning of the war as the industries which had to turn out the implements and agents of destruction and defense. But the essential requirements of the civilian population are not fixed in quantity nor invariable in quality, and both were therefore sharply restricted during the war in the interest of the war.

The policy of providing food, clothing, and personal equipment, first for the fighting forces, and then for the civilian population, resulted in curtailing and in some cases suspending the operation of plants whose equipment could not be converted to the necessary service of the war or civil life. As a consequence, branches of some of these industries were omitted from the list of the Priorities Board, charged with the duty of allotting fuel, materials, transportation, and labor to the best advantage of the Nation in prosecuting the war. On the other hand, many individual plants in these omitted industries were included in a preference list because they were important to the equipment of the fighting forces or were engaged in the manufacture during the war of other essential products. For example, the manufacture of household furniture and of lumber for civil construction did not appear among "essential industries" on the list of the Priorities Board, but many firms milling lumber for airplanes and many furniture factories making airplane parts were given preference in materials and labor. It is plain, therefore, that there is no clear demarcation between the obvious "war industries" popularly so called, and those generally regarded as "nonwar industries." In order, however, to distinguish in this discussion the industries chiefly concerned in the manufacture of actual weapons of offense and defense, including airplanes and aviation equipment, from the industries equally essential to the equipment of the fighting forces, but required also during the war to produce for the civilian population, the first group have been called the "war agent and implement industries," and the second, the "war food and fabric industries." These terms have been used to avoid the error implied in labeling the industries concerned in making weapons as "war industries," to the exclusion of others equally essential to the war but not con-

spicuous because, unlike the first group, the general nature of their products was often not changed by the requirements of the war. In grouping the firms covered by this survey by industries, the basis of classification has been the chief product of the plant in 1918 during the war period, rather than the product before the plant had been transformed for war purposes. In many cases the product of the two periods was identical.

WOMEN IN INDUSTRY IN THE PREWAR PERIOD.

Attention should be called at this point to the great concentration of woman labor before the war in the food and fabric industries. To get the full significance of the trend of woman labor during the war, it is essential to bear in mind the hold which these industries had upon woman workers up to our entrance into the conflict. The following table, compiled from the Census of Manufactures of 1914, shows that of all the women employed in the manufacturing industries in 1914, three-fourths were making wearing apparel or its materials, food, or tobacco products.[11]

TABLE 2.—NUMBER AND PER CENT OF WOMAN WAGE EARNERS EMPLOYED IN THE FIVE PRINCIPAL WOMAN-EMPLOYING INDUSTRIES IN THE UNITED STATES, 1914.[1]

Industrial group.	Woman wage earners.	
	Number.	Per cent of total in all industries.
Textiles	421,386	27.4
Personal apparel	352,486	22.9
Food products	197,035	12.8
Tobacco products	98,241	6.4
Hand and footwear	87,721	5.7
Total for five industrial groups [2]	1,156,869	[2] 75.2
Total for all industries	1,539,190	100.0

[1] Compiled from U. S. Bureau of Census, Abstract of the Census of Manufactures, 1914, pp. 530-543.
[2] The 75.2 per cent includes 64 of the 342 divisions into which the 1914 Manufactures Census has separated all industries. The remaining 24.8 per cent were employed in the other 278 industries.

The activities represented in Table 2 include 64 separately listed industries. There were fewer than 400,000 women scattered throughout the other 278 industries separately listed in the Census of Manufactures of 1914. Furthermore, over half the 116 industries that employ 10,000 or more wage earners report less than a 10 per cent proportion of women on their working forces, the proportion in many important industries running close to or below 5 per cent. Among the industries with a larger proportion of woman workers, exclusive of those shown in Table 2, the most notable in numbers are the paper-box, bookbinding, and printing industries and the manufacture of electrical machinery and supplies. The really significant exceptions to the 10 per cent rule are the proportions of women on the prewar working forces in the hardware and tinware industries, in

[11] The number of wage earners employed on one representative day (usually Dec. 15, 1914) has been used in this table and throughout the report where census figures are quoted. These figures involve less duplication and are therefore more accurate than the average number of wage earners which is perhaps more frequently used. Furthermore, the average number of wage earners is not given by sex for workers under 16 years of age, and it would therefore be impossible to get complete figures for women employed should this set of figures have been used.

the ammunition factories, in the manufacture of electrical equipment and supplies, and a few more of the smaller branches of the metal trades. They represent the high-water mark attained by women before the war in the metal-working plants that sprang into such sudden and urgent importance as war implement industries upon our entrance into the war. The proportion of women in these establishments varied from 13 per cent to 30 per cent, and the extent to which they had gained a footing in such establishments before the war undoubtedly exerted its influence when the emergency created by the war sent the other metal manufacturing firms into a vigorous campaign for labor.

TREND OF WOMAN LABOR DURING THE WAR.

ALL INDUSTRIES.

The six tables which follow show the trend of woman workers during the war away from the traditional strongholds of woman labor—which are the chief "war food and fabric industries"—to the "war agent and implement industries." The more important industries have been grouped in the following tables, as already stated, in accordance with the information contained in the official report of the Assistant Secretary of War concerning the manufacture of war materials. Census data have been introduced here to indicate the proportion of the prewar industry which was covered in this war-time study. In a few cases, such as in the manufacture of airplanes, firearms, and ammunition, the growth of the industry was so meteoric during the war period that the group of firms and wage earners covered in this survey far exceeded in number the 1914 census figures for the same industries. These were the exception, however, rather than the rule. The comparison with the census figures for the most part, however, indicates the extensiveness of the material made available for this investigation. It will be found that though often a small percentage of plants appears to be covered, a considerable proportion of the wage earners employed are involved, indicating that the larger and more important plants are included.

Comparison is made in these tables between two periods—the first, during February and March, 1918, or seven to eight months after the first draft, and the second, during October and November, 1918, or four to five months after the first drawing of the second draft. The tables are based exclusively on data from firms that reported after both the first and second drafts. They are important, therefore, principally as showing the percentage of increase or decrease in the woman labor force in identical firms rather than as reflecting the total numbers employed at any given time in a particular industrial group. Except where the numbers of women involved per plant are so small as to suggest the probability of employment for some special service rather than for manufacturing processes, the increase in the number of firms employing women in war agent and implement industries is significant, since an increase in the number of firms employing women in industrial departments shows that there was a spread of woman labor in the industry as a whole, and not merely in the plants that had previously employed women. The increase in the number of firms employing women in the war food

and fabric industries was negligible, because practically all plants in these industries already employed women in the first period shown. For this reason figures on this point are not presented for these industries.

IRON AND STEEL AND THEIR PRODUCTS.

Table 3 shows the trend of labor in the chief branches of the iron and steel industry. In every branch the force of women showed an increase between the first and second drafts, ranging from 18 per cent to over 200 per cent. In two cases—structural iron work and engines and pumps—the number of women had tripled, although in the former instance, because of the small number of women involved, the increase is of minor significance. In foundries and machine shops and in firearms and ammunition, the two branches employing largest numbers of women, the increases were 100.6 per cent and 69.3 per cent, respectively. For the iron and steel industry as a whole the force of women increased nearly 70 per cent, while for men the increase was only 5 per cent. The men showed a decrease in 6 of the 12 branches represented.

METAL TRADES OTHER THAN IRON AND STEEL.

Table 4 presents corresponding data for the metal trades other than iron and steel. In these industries the force of women increased in every branch except jewelry, and here the decrease was only 1.5 per cent, as compared with a 36.8 per cent decrease in men workers in this industry, the result being a rise in the importance of women in the force from 265 to 360 in every 1,000 wage earners employed. Through all other branches of the metal industry here shown women gained not only in actual numbers but in the proportion they formed of the total force. In numbers they increased as a whole 17 per cent in this industry.

CHEMICAL PRODUCTS.

The manufacture of chemicals and allied products showed an even greater per cent of increase in women employed than the metal trades, though neither industry reached the proportion of increase shown in the iron and steel industry. Here again the men showed a small per cent of decrease in every branch except explosives, as shown in Table 5.

OTHER WAR AGENT AND IMPLEMENT INDUSTRIES.

Table 6 presents the same data for seven more of the important war agent and implement industries. The evidence here bears out what has already been seen in the manufacture of steel, other metals, and chemicals, the proportion of increase in the force of women varying from 17 per cent for the stone, clay, and glass industry to 241.1 per cent in the making of automobiles. In the manufacture of agricultural implements a significant increase of 170.1 per cent took place in the number of women employed after the second draft as compared with the force after the first draft. In addition to its peace-time product which was essential to the maintainance of both the civil and fighting population, this industry manufactured such war

necessities as tanks, trucks, shells, grenades, and special ordnance. In four out of the seven industries shown the force of men decreased; and in the remaining three the increase was proportionately less than for women, though in actual numbers it exceeded the force of women because of the preponderance of men in industries of that type.

FOOD, TOBACCO, AND CLOTHING INDUSTRIES.

Tables 7 and 8 indicate the trend of labor in some of the traditional woman-employing industries. The manufacture of tobacco showed a decrease in both men and women employed, while the food industries as a whole showed an increase for both sexes which slightly exceeded in proportion that shown for the metal trades and stone, clay and glass products, but fell far behind all other of the newer industries for women, which have been presented in Tables 3, 5, and 6. As women already had a fair foothold in some of the metal trades and in the pottery industry, these exceptions do not destroy the validity of the inference that the tendency of woman labor during the war was away from the older food and fabric industries to the newer war implement industries. This inference is greatly strengthened by the table showing the trend of labor during the war in the textile, clothing, hand and footwear industries, all of which, with the sole exception of men's furnishing goods, showed decreases in the force of both men and women, ranging for women from 3.6 per cent in the cotton-goods industry to 27 per cent in the manufacture of hats and caps.

TABLE 3.—CHANGE IN LABOR FORCE DURING THE WAR IN PLANTS IN THE IRON AND STEEL INDUSTRY AND PROPORTION OF THIS INDUSTRY REPRESENTED IN THE SURVEY, BY BRANCH OF INDUSTRY.

Branch of industry.	Wage earners.			Firms.			Change in labor force during the war.									
		Represented in this survey.			Represented in this survey.		After first draft.				After second draft.					
							Wage earners.		Firms employing women.		Wage earners.				Firms employing women.	
											Number.		Per cent increase (+) or decrease (−) over first draft.			
	Total in industry.[1]	Number.[2]	Per cent of total.	Total in industry.[1]	Number.	Per cent of total.	Men.	Women.	Number.	Per cent of total included in this survey.	Men.	Women.	Men.	Women.	Number.	Per cent increase over first draft.
Foundry and machine-shop products[3]	398,251	182,697	45.9	11,208	1,175	10.5	169,768	5,509	423	36.0	171,646	11,051	+ 1.1	+100.6	491	16.1
Crude iron and steel and rolled products	278,605	49,022	17.6	587	93	15.8	48,423	599	33	35.5	47,694	976	− 1.5	+ 62.9	41	24.2
Hardware	63,226	19,326	30.6	841	102	12.1	16,415	2,911	66	64.7	15,262	3,437	− 7.0	+ 18.1	75	13.6
Structural iron work	48,022	7,125	14.9	1,278	81	6.3	6,745	15	8	9.9	7,072	53	+ 4.8	+253.3	12	50.0
Stoves and furnaces	47,319	9,455	20.0	640	88	13.8	9,214	241	40	45.5	7,572	384	−17.8	+ 59.3	40	.....
Cutlery and tools	41,944	30,902	73.7	1,061	283	26.7	26,279	3,562	120	42.4	25,735	5,167	− 2.1	+ 45.1	142	18.3
Engines and pumps	36,995	19,782	53.5	629	98	15.6	17,630	420	41	41.8	18,462	1,320	+ 4.7	+214.3	54	31.7
Small machines for home and office use	31,794	10,519	33.1	205	30	14.6	8,684	1,835	23	76.7	6,916	3,308	−20.4	+ 80.3	27	17.4
Wire and wire work	28,554	6,166	21.6	606	48	7.9	5,537	407	26	54.2	5,538	628	(4)	+ 54.3	27	3.8
Firearms and ammunition	22,235	81,369	(5)	61	74	(5)	47,150	8,017	46	62.2	67,798	13,571	+43.8	+ 69.3	58	26.1
Tinplate and terneplate	5,818	7,863	(5)	31	6	19.4	6,544	236	6	100.0	7,544	319	+15.3	+ 35.2	6	.....
Springs, steel-car and carriage	3,867	1,876	48.5	84	26	31.0	1,624	175	14	53.8	1,543	333	− 5.0	+ 90.3	14	.....
Total	1,006,630	426,102	42.3	17,231	[6] 2,104	12.2	364,013	23,927	846	40.2	382,782	40,547	+ 5.2	+ 69.5	987	16.7

[1] United States Bureau of Census. Abstract of Census of Manufactures, 1914, pp. 516–543. Figures for wage earners give number on Dec. 15, 1914, or nearest representative day.
[2] Represents maximum number employed at either of the two periods covered. The total therefore does not represent necessarily the total employed at one time or the other.
[3] Includes cast iron, wrought pipe, forgings, horseshoes, and plumbers' supplies.
[4] Less than one-tenth of 1 per cent.
[5] The demands of war so expanded the industry that the number of wage earners included in this survey for the war period exceeded the number reported in the Census of Manufactures for 1914.
[6] As only principal branches of the iron and steel industry are included in this table, the totals do not agree with those in Tables 10 and 22, which include also minor branches and firms reporting only after the second draft.

TABLE 4.—CHANGE IN LABOR FORCE DURING THE WAR IN PLANTS REPRESENTING THE MANUFACTURE OF METAL PRODUCTS OTHER THAN IRON AND STEEL, AND PROPORTION OF THIS INDUSTRY REPRESENTED IN THE SURVEY, BY BRANCH OF INDUSTRY.

Branch of industry.	Wage earners.			Firms.			Change in labor force during the war.									
		Represented in this survey.			Represented in this survey.		After first draft.				After second draft.					
							Wage earners.		Firms employing women.		Wage earners.				Firms employing women.	
											Number.		Per cent increase (+) or decrease (−) over first draft.			
	Total in industry.[1]	Number.[2]	Per cent of total.	Total in industry.[1]	Number.	Per cent of total.	Men.	Women.	Number.	Per cent of total included in this survey.	Men.	Women.	Men.	Women.	Number.	Per cent increase over first draft.
Brass, bronze, and copper products	39,911	35,683	89.4	992	184	18.5	28,956	3,788	72	38.9	29,817	5,866	+ 3.0	+ 54.9	86	19.4
Copper, tin, and sheet-iron work	29,020	11,187	38.5	4,527	168	3.7	10,295	814	60	35.7	10,016	958	− 2.7	+ 17.7	66	10.0
Jewelry	28,523	9,008	31.6	1,914	209	10.9	6,617	2,391	174	83.2	4,179	2,354	−36.8	− 1.5	181	4.0
Stamped and enameled ware	27,731	4,579	16.5	270	34	12.6	3,451	1,042	25	73.5	3,248	1,331	− 5.9	+ 27.7	28	12.0
Smelting and refining copper and zinc	27,594	22,023	79.8	66	30	45.5	21,935	88	8	26.6	20,038	223	− 8.6	+153.4	10	25.0
Clocks and watches	25,114	10,419	45.1	119	18	15.1	6,352	4,067	16	88.8	5,622	4,178	−11.5	+ 2.7	16	.....
Tinware	21,183	10,971	51.8	294	64	21.8	7,664	3,307	48	75.0	6,587	3,335	−14.1	+ .8	50	4.2
All other[3]	60,786	33,325	54.8	1,737	189	10.9	27,791	4,286	115	61.8	27,111	4,905	− 2.4	+ 14.4	121	5.2
Total	257,862	137,195	53.2	9,919	896	9.0	113,061	19,783	518	57.9	106,618	23,150	− 5.7	+ 17.0	558	7.7

[1] United States Bureau of Census. Abstract of Census of Manufactures, 1914, pp. 516–543. Figures for wage earners give number on Dec. 15, 1914, or nearest representative day.

[2] Represents the maximum number employed at either of the two periods covered. The total therefore does not represent the total employed at one time or the other.

[3] Except gold and silver reducing and refining, and bell and tin-foil manufacture, which were not covered in this survey.

TABLE 5.—CHANGE IN LABOR FORCE DURING THE WAR IN PLANTS REPRESENTING THE CHEMICAL INDUSTRY AND PROPORTION OF THIS INDUSTRY REPRESENTED IN THE SURVEY, BY BRANCH OF INDUSTRY.

Branch of industry.	Wage earners.			Firms.			Change in labor force during the war.									
		Represented in this survey.			Represented in this survey.		After first draft.				After second draft.					
							Wage earners.		Firms employing women.		Wage earners.				Firms employing women.	
											Number.		Per cent increase (+) or decrease (−) over first draft.			
	Total in industry.[1]	Number.[2]	Per cent of total.	Total in industry.[1]	Number.	Per cent of total.	Men.	Women.	Number.	Per cent of total included in this survey.	Men.	Women.	Men.	Women.	Number.	Per cent increase over first draft.
Chemicals and acids	36,029	16,477	45.7	427	71	16.6	15,336	1,141	42	59.2	14,749	1,461	−3.8	+ 28.0	47	11.9
Petroleum refining	24,938	24,305	97.5	176	79	44.9	22,951	497	48	60.8	22,910	1,395	− .2	+180.7	59	22.9
Explosives	7,317	9,276	[3]	152	23	15.1	7,098	1,144	16	69.6	7,140	2,136	+ .6	+ 86.7	18	12.5
Dyestuffs, extracts, and bluing	3,256	5,950	[3]	178	44	24.7	5,625	232	21	47.7	5,473	477	−2.7	+105.6	25	.2
All others	210,696	40,143	19.1	10,088	516	5.1	31,886	5,972	364	70.5	29,523	7,761	−7.4	+ 30.0	404	11.0
Total	282,236	96,151	34.1	11,021	733	6.7	82,896	8,986	491	67.0	79,795	13,230	−3.7	+ 47.2	553	12.6

[1] United States Bureau of Census. Abstract of Census of Manufactures 1914, pp. 516-543. Figures for wage earners give number on Dec. 15, 1914, or nearest representative day.

[2] Represents the maximum number employed at either of the two periods covered. The total therefore does not represent the total employed at one time or the other.

[3] The demands of the war so expanded the industry that the number of wage earners included in this survey for the war period exceeded the number reported in the Census of Manufactures for 1914.

TABLE 6.—CHANGE IN LABOR FORCE DURING THE WAR IN PLANTS REPRESENTING SEVEN LEADING WAR AGENT AND IMPLEMENT INDUSTRIES AND PROPORTION OF THESE INDUSTRIES REPRESENTED IN THE SURVEY.

Industry.	Wage earners.			Firms.			Change in labor force during the war.									
		Represented in this survey.			Represented in this survey.		After first draft.				After second draft.					
							Wage earners.		Firms employing women.		Wage earners.				Firms employing women.	
											Number.		Per cent increase (+) or decrease (−) over first draft.			
	Total in industry.[1]	Number.[2]	Per cent of total.	Total in industry.[1]	Number.	Per cent of total.	Men.	Women.	Number.	Per cent of total included in this survey.	Men.	Women.	Men.	Women.	Number.	Per cent increase over first draft.
Lumber and its remanufactures	941,100	155,413	16.5	42,016	1,352	3.2	147,312	7,184	625	46.2	128,953	13,325	−12.5	+ 85.5	846	35.4
Stone, clay, and glass products	381,296	38,680	10.1	15,112	322	2.1	34,239	4,441	190	59.0	28,272	5,197	−17.4	+ 17.0	211	11.0
Automobiles and parts	129,038	43,053	33.4	1,271	[3] 144	11.3	31,366	1,437	90	62.5	38,151	4,902	+21.6	+241.1	107	16.7
Electrical machinery, apparatus, and supplies	111,251	25,177	22.6	1,030	172	16.7	19,352	5,277	132	76.7	18,391	6,786	− 5.0	+ 28.6	155	17.4
Agricultural implements	49,608	32,689	65.9	601	116	19.3	32,201	488	37	31.9	29,059	1,318	− 9.8	+170.1	57	54.1
Shipbuilding	42,735	60,058	(4)	1,147	[5] 72	6.3	42,317	246	22	30.6	59,646	412	+40.9	+ 67.5	27	13.6
Airplanes, seaplanes, and parts[6]	211	14,469	(4)	16	[7] 34	(4)	10,268	1,887	18	52.9	11,773	2,696	+14.7	+ 42.9	26	44.4

[1] United States Bureau of Census. Abstract of the Census of Manufactures, 1914, pp. 516–543. Figures for wage earners give number on Dec. 15, 1914, or nearest representative day.

[2] Represents the maximum number employed at either of the two periods covered. The total therefore does not represent the total employed at one time or the other.

[3] As only identical firms reporting numbers employed after the first and after the second drafts are included in this table, 19 firms reporting only for the period after the second draft, but employing 131,113 wage earners (of whom 9,500 were women), are omitted.

[4] The demands of the war so expanded the industry that the number of plants and wage earners included in this survey for the war period exceeded the number reported in the Census of Manufactures for 1914.

[5] As only identical firms reporting numbers employed after the first and after the second drafts are included in this table, 5 firms not reporting for the period after the first draft, but employing 36,186 wage earners after the second draft (634 of whom were women), are omitted.

[6] This group includes only such firms as were engaged exclusively in the manufacture of airplanes, seaplanes, and parts. Firms engaged in manufacture of furniture, automobiles, and scientific instruments but making also parts for airplanes were included in their own industrial groups.

[7] As only identical firms reporting numbers employed after first and after second drafts are included in this table, 6 firms reporting only for period after second draft, but employing 12,001 wage earners (of whom 3,412 were women), are omitted.

TABLE 7.—CHANGE IN LABOR FORCE DURING THE WAR IN PLANTS REPRESENTING THE FOOD AND TOBACCO INDUSTRIES AND PROPORTION OF THESE INDUSTRIES REPRESENTED IN THE SURVEY, BY BRANCH OF INDUSTRY.

Branch of industry.	Wage earners.			Firms.			Change in labor force during the war.					
							After first draft.		After second draft.			
									Number.		Per cent increase (+) or decrease (−) over first draft.	
	Total in industry.[1]	Represented in this survey.		Total in industry.[1]	Represented in this survey.							
		Number.[2]	Per cent of total.		Number.	Per cent of total.	Men.	Women.	Men.	Women.	Men.	Women.
Bread and bakery products	128,119	14,980	11.7	25,963	183	0.7	9,189	4,727	9,023	5,957	− 1.8	+26.0
Slaughtering and meat packing	105,193	73,459	69.8	1,279	95	7.4	55,361	7,081	62,006	11,453	+12.0	+61.7
Confectionery, cocoa, and chocolate	74,424	26,100	35.1	4,864	289	5.9	11,253	14,847	9,697	14,012	−13.8	− 5.6
Sugar, beet and cane	45,962	5,791	12.6	259	15	5.8	5,524	267	4,598	357	−16.8	+33.7
Flour-mill and gristmill products	41,736	11,951	28.6	10,788	241	2.2	9,510	991	10,426	1,525	+ 9.6	+53.9
Food preparations, including starch and glucose	27,874	12,140	43.6	1,648	102	6.2	7,679	3,027	8,280	3,860	+ 7.8	+27.5
Butter, cheese, and condensed milk	24,089	12,732	52.9	7,645	223	2.9	10,107	1,713	10,600	2,132	+ 4.9	+24.5
Coffee and spices	8,288	2,721	32.8	696	61	8.8	1,355	1,228	1,339	1,382	− 1.2	+12.5
All other food products[3]	15,784	1,948	12.6	1,955	49	2.5	1,352	359	1,423	511	+ 5.3	+42.3
Total for food industries	471,469	161,822	34.3	55,097	1,258	2.3	111,330	34,240	117,392	41,189	+ 5.4	+20.3
Tobacco and tobacco products	182,108	40,348	22.2	13,951	378	2.7	17,490	22,858	14,634	20,245	−16.3	−11.4
Grand total	653,577	202,170	30.9	69,048	1,636	23.7	128,820	57,098	132,026	61,434	+ 2.5	+ 7.6

[1] United States Bureau of Census. Abstract of Census of Manufactures, 1914, pp. 516-543. Figures for wage earners give number on Dec. 15, 1914, or nearest representative day.

[2] Represents the maximum number employed at either of the two periods covered. The total therefore does nor represent the total employed at one time or the other.

[3] Canning and preserving were omitted, as the seasonal nature of the industry destroyed the significance of the figures as indicating the effect of the war.

TABLE 8.—CHANGE IN LABOR FORCE DURING THE WAR IN PLANTS REPRESENTING THE TEXTILE, CLOTHING, SHOE, AND GLOVE INDUSTRIES AND PROPORTION OF THESE INDUSTRIES REPRESENTED IN THE SURVEY, BY BRANCH OF INDUSTRY.

Branch of industry.	Wage earners.			Firms.			Change in labor force during the war.					
							After first draft.		After second draft.			
									Number.		Per cent increase (+) or decrease (−) over first draft.	
	Total in industry.[1]	Represented in this survey.		Total in industry.[1]	Represented in this survey.							
		Number.[2]	Per cent of total.		Number.	Per cent of total.	Men.	Women.	Men.	Women.	Men.	Women.
Cotton goods	394,748	105,472	26.7	1,287	308	23.9	59,407	46,065	53,681	44,388	− 9.6	− 3.6
Woolen and worsted goods	168,089	68,020	40.5	921	244	26.5	37,722	30,298	34,591	27,522	− 8.3	− 9.2
Hosiery and knit goods	153,438	55,331	36.1	1,622	346	21.3	16,701	38,630	15,459	34,661	− 7.4	−10.3
Silk and silk goods	106,508	23,753	22.3	902	130	14.4	9,784	13,969	8,636	12,806	−11.7	− 8.3
Dyeing and finishing textiles	46,776	11,833	25.3	507	63	12.4	9,141	2,692	8,298	2,568	− 9.2	− 4.6
Cordage and twine, jute and linen goods	26,612	10,669	40.1	160	63	39.4	6,176	4,493	4,907	3,843	−20.5	−14.5
Total for textile industries	896,171	275,078	30.7	5,399	1,154	21.4	138,931	136,147	125,572	125,788	− 9.6	− 7.6
Clothing, men's, including shirts, collars, and working clothes	243,186	57,001	23.4	5,657	652	11.5	20,106	36,895	17,566	32,107	−12.6	−13.0
Clothing, women and childrens'	194,720	49,243	25.2	5,731	1,143	19.9	13,708	35,535	10,822	30,185	−21.1	−15.1
Hats, caps, and materials	42,929	20,703	48.2	1,081	323	29.9	9,454	11,249	7,186	8,208	−24.0	−27.0
Furnishing goods, men's	23,220	11,710	50.4	551	119	21.6	3,382	6,748	3,579	8,131	+ 5.8	+20.5
Total for clothing industry	504,055	138,657	27.5	13,020	2,237	17.2	46,650	90,427	39,153	78,631	−16.1	−13.0
Boots and shoes	209,992	61,315	29.2	1,960	272	13.9	37,556	23,759	34,196	23,376	− 8.9	− 1.6
Gloves and mittens, leather	11,026	9,918	90.0	352	127	36.1	3,597	6,321	3,173	6,199	−11.8	− 1.9
Grand total	1,621,244	484,968	29.9	20,731	3,790	18.3	226,734	256,654	202,094	233,994	−10.9	− 8.8

[1] United States Bureau of Census. Abstract of Census of Manufactures, 1914, pp. 516-543. Figures for wage earners give number on Dec. 15, 1914, or nearest representative day.
[2] Represents the maximum number employed at either of the two periods covered. The total therefore does not represent the total employed at one time or the other.

EMPLOYMENT AND SUBSTITUTION OF WOMEN DURING THE WORLD WAR.

The preceding discussion and tables have shown the trend of woman labor away from her time-honored tasks in textile mill, clothing shop, and candy factory into the newer environment of the machine shop, the chemical plant, and the planing mill. The following discussion and tabular material will present the more detailed facts, for a wider range of industries, regarding the actual changes in the labor force of men and women, the changes in the proportion of women employed, and the actual numbers of women substituted on men's work. These tables (9 to 24) summarize the pertinent information from 14,671 schedules, officially submitted to the War Industries Board and other Federal agencies mentioned in the earlier pages of this report.[12] They show for each industry the number of men and women employed after the first and after the second draft, the number of firms employing women after the second draft, the number of firms substituting women in place of men, and the number of women substituted, the number of firms expanding the woman labor force without such substitution, and the number of women added in this way.

For 12 leading industries the figures are given for all their branches, and for 21 others the same facts are summarized for each industry as a whole. For iron and steel, the metal trades, and the lumber industry, data are also presented by the States in which the plants are located.

The industrial grouping of the United States Census of Manufactures for 1914 was followed in assorting and assembling the material presented in the tables. The two war periods represented, namely, February and March, 1918, and October and November, 1918, are the same as those in the tables of the preceding section, showing the trend of labor during the war in leading industries representative of old and new occupations of women.

It should be borne in mind that the figures on substitutions cover only those occurring before the signing of the armistice. Also, it should be remembered that these were the reports direct from the firms in answer to the specific question as to how many women had been substituted in men's places. Judging from personal interviews and letters from several hundreds of the firms, it is apparent that the question was taken quite literally.

If women had been employed to do work which had previously been regarded as men's work, but which had not been done in that plant at all before, the firm's report would show "no substitutions." Often, too, work which men had been doing exclusively before or early in the war was so expanded as to require a larger force and was shared by women, no men having been displaced. Sometimes these women would not be included as women substituted on men's work by the firms reporting.

The critical analysis of the results of substitution presented later reveals the difficult "twilight" zone in the field of substitution. There was a marked tendency, when doubt clouded the subject, to report no substitutions, but to record simply an increased number of

[12] See pp. 36–38.

woman employees. The figures for substitution, therefore, shown (in Tables 9 to 24) are unquestionably well below rather than above the level of substitutions which took place before the signing of the armistice, as they do not include a number of women who were employed in occupations that had been the exclusive industrial province of men before the war, though the women doing the work had not actually displaced any men. The work itself had been expanded and the women had been employed to meet the expansion. That this is true is strongly indicated by the tables prepared in connection with the critical analysis of substitutions, and arranged by crafts rather than by industry.[13] These tables summarize data secured by direct questioning of firms in the course of the field work, and therefore present a more accurate picture of the extent of substitution of women on men's work.

While the discriminations of the firms as to what were and what were not substitutions were accepted, the questioning of the field agent in her interview with the employer checked the tendency to ignore all factors except the actual displacement of identifiable men in reporting the number of substitutions. The 562 firms thus questioned had substituted on men's work up to August, 1919, over 58,000 women, while the entire 3,558 firms reporting without analytical questioning by field agents record approximately 70,000 women substitutes up to the close of the war. The difference in the relative number of substitutions reported is too great to be explained entirely by the difference in periods of time. The records here presented, therefore, are evidently a conservative measurement of the substitution of women on men's work during the war in the industries represented by this survey.

Furthermore, too great significance should not be attached to the proportion of firms employing women, because a careful scrutiny of the tables which follow will reveal evidences of firms employing one or two women. Before the field work was started and verification of the documentary material could be made, these cases were regarded as probable errors, in that the office stenographer or bookkeeper had been included, and it was thought that no women were employed in the industrial departments. While there were occasional errors of this sort, in a large number of cases the reports were correct technically, as the women were employed in the industrial departments, but were doing work not peculiar to any particular line of manufacture. Sometimes they were in the factory lunch room, either having replaced a man or having been taken on when the stress of war work made it necessary to provide lunching facilities. The actual numbers of such women included in the number substituted and the number employed during the war was relatively small, but they may materially affect the number of firms employing women. A hundred such women in the more than half million employed would not weigh heavily in the results, but they might add a hundred firms that really employed no women in manufacturing processes.

A close inspection of the following tables will reveal the branches of the several industries where this circumstance probably exists. Where a few firms have a large number of men and but two or three women, it is obvious that the firms have not undertaken to substitute

[13] See Tables 29–33.

women for men in manufacturing processes to any extent. It is safe to assume that while the one or two women were not office women, they were doing special work of some nature. This applies only, of course, where the women number but one or two in a plant, while the force of men runs into large numbers. In spite of the slight margin of error to be reckoned with in treating the number of firms employing women, the material seems of sufficient value and significance to consider in attempting to determine the flow of women's work into new channels.

ALL INDUSTRIES.

Table 9 presents a synthesis of the basic data contained in the succeeding tables. It shows the total number of firms reporting during the war in all the industries included in this survey, the number of these firms employing women after the second draft, and the number of them which substituted women, the force of wage earners employed after the second draft, the number of women employed after the second draft, the per cent of increase over the number employed after the first draft, and the proportion they form of the force as a whole, the total number of women substituted, and the proportion they form of all women employed.

The 14,629 firms included in this table employed nearly 2,500,000 wage earners at the height of the war period, of whom 528,228 were women, or a proportion of 228 women for every 1,000 wage earners of both sexes. In the various industries included, the proportion of women varied from 11 in every 1,000 employed in shipbuilding to 580 in every 1,000 engaged in manufacturing tobacco products. Aside from tobacco, textiles and clothing, hats and caps, and buttons, all of which are traditional employments for women, the makers of surgical appliances and artificial limbs were the only ones to employ a force more than half of which was made up of women. Other industries showing a proportion of 20 per cent or more of women on their labor force were electrical machinery, apparatus and supplies, airplanes, seaplanes and parts, optical goods, motion picture and photographic apparatus and supplies, musical instruments, leather goods and its finished products, rubber goods, dental goods, fur tanning, dyeing, and its remanufactures, food and food products, toys and sporting goods, paper and paper products, and printing and publishing. The smallest proportion of women, aside from shipbuilding, was found in the manufacture of beverages, of agricultural implements (despite the fact that its force of women was nearly tripled during the last eight months of the war), in railway repair shops, and in the making of carriages and wagons and their materials. It is interesting to note that in all of the industries in which the number of women had been doubled or better the proportion which they formed of the total labor force was still less than 10 per cent. In other words, the largest rate of increase was found in the industries in which women formed the least important part of the force, though the actual increase in numbers might be smallest here.

In considering the proportion which women form of the labor force in an industry it should be noted that a considerable number of plants, especially in the war implement industries, did not employ women at all. The proportion of women in individual plants, therefore, was usually much higher than that shown for the industry as a whole, the figures for the plants employing women being somewhat neutralized by the figures for those which did not. The same qualification should be borne in mind in considering the proportions of substitutions. Often less than half the number of plants which employed women were substituting them on men's work. The proportion of women substituted in individual plants where substitution occurred was higher, therefore, than the proportion for the industry as a whole. In the detailed tables which follow this summary table, figures showing the number of women substituted are shown in juxtaposition to figures showing the number of women employed in plants in which substitution occurred. Table 9, however, has attempted to show the extent of substitution in each industry as a whole.

The proportion of women substituted on men's work was highest in the manufacture of motor cycles and bicycles where 784 in each thousand women employed were being used in direct replacement of men. Other industries with a high proportion of substitutions were, in order of importance, shipbuilding, the manufacture of cars for steam and electric railroads, of automobiles, of agricultural implements, and of airplanes and seaplanes. All of these industries were substituting on men's work more than half the women on their labor force. They are industries, however, which in actual numbers employ comparatively few women, although they are the same ones which show the most rapid rate of increase in their woman labor force. The traditional woman-employing industries, such as textiles, food products, and tobacco, of course, did little in the way of substituting women on men's work. Since the proportion of women employed was already large, few occupations remained in which they were not already used, and the tendency in many of these plants during the war was toward a decrease in numbers employed despite the heavy demands made on them for production.

TABLE 9.—PROPORTION OF WOMEN EMPLOYED AND SUBSTITUTED AFTER THE SECOND DRAFT AND INCREASE OR DECREASE IN THEIR EMPLOYMENT OVER PERIOD AFTER FIRST DRAFT, IN WAR AGENT AND IMPLEMENT AND WAR FOOD AND FABRIC INDUSTRIES.[1]

Industry.	Firms reporting after second draft.			Wage earners after second draft.					
					Women.				
					Total employed.			Total substituted.	
	Total.	Number employing women.	Number substituting women.	Total.	Number.	Number per 1,000 wage earners.	Per cent increase (+) or decrease (−) over first draft.[2]	Number.	Number per 1,000 women employed.
Iron and steel	2,140	1,011	430	551,854	60,694	110	+ 69.5	19,171	316
Metal and metal products other than iron and steel	896	558	204	129,768	23,150	178	+ 17.0	3,752	162
Lumber and its remanufactures	1,352	846	470	142,278	13,325	94	+ 85.5	6,066	455
Chemicals and allied products	737	557	205	166,534	23,260	140	+ 47.2	3,750	161
Electrical machinery, apparatus, and supplies	172	155	87	25,177	6,786	270	+ 28.6	1,385	204
Cars, steam and electric railroad	15	8	8	14,365	836	58	+158.0	556	665
Railroad repair shops	10	6	3	4,197	182	43	+ 32.8	37	203
Motor cycles, bicycles, and parts	7	6	4	2,927	287	98	+ 70.8	225	784
Automobiles, including bodies and parts	163	126	62	174,166	14,402	83	+241.1	8,656	601
Airplanes, seaplanes, and parts	40	32	24	26,470	6,108	231	+ 42.9	3,211	526
Shipbuilding, including boat building	77	30	12	96,244	1,046	11	+ 67.5	554	686
Carriages, wagons, and materials	36	23	10	3,573	162	45	+107.7	51	315
Agricultural implements	116	57	29	30,377	1,318	43	+170.1	743	564
Instruments, scientific and professional	46	38	19	5,224	892	171	+ 16.1	278	312
Optical goods	21	21	11	1,365	507	371	+ 9.7	103	203
Motion picture and photographic apparatus and supplies	32	30	13	9,519	3,339	351	+ 18.1	346	104
Musical instruments	77	64	41	13,703	3,557	260	+ 51.9	1,048	295
Leather and its finished products	810	711	231	107,634	35,513	330	+ 1.4	3,551	100
Rubber goods	83	76	34	43,246	11,688	270	+ 17.2	1,369	117
Stone, clay, and glass products	322	211	73	33,469	5,197	155	+ 17.0	1,092	210
Surgical appliances and artificial limbs	30	29	7	3,117	1,716	551	+ 31.4	110	64
Dental goods	14	14	5	1,681	749	446	− 3.5	38	51
Textiles and their products	3,306	3,283	582	372,072	206,565	555	− 8.5	5,517	27
Hats, caps, and their materials	323	312	27	15,394	8,208	533	− 37.0	104	13
Fur, tanning, dyeing, and its remanufactures	122	93	4	3,420	1,048	306	− 7.8	26	25
Buttons	44	33	6	2,688	1,406	523	− 7.2	46	33
Food and food products	1,258	1,132	395	158,581	41,189	260	+ 20.3	3,055	74
Tobacco and tobacco products	378	357	64	34,879	20,245	580	− 11.4	610	30
Beverages	314	163	51	16,257	506	31	+ 43.3	144	285

Toys and sporting goods	53	50	18	2,186	827	378	+ 1.8	112	135
Paper and paper products	551	474	124	59,622	14,028	235	+ 5.0	917	65
Printing and publishing	705	579	194	46,618	12,727	273	+ 4.1	852	72
Miscellaneous goods	379	340	102	19,234	6,766	352	− 7.4	637	94
Total	14,629	11,425	3,549	2,317,839	528,229	228	+ 5.5	68,112	129

[1] In several of the industries some firms reported only after the second draft, and the figures in this table include these firms, except in column showing increase or decrease.
[2] This column represents increase or decrease in identical firms reporting after both first and second drafts.

IRON AND STEEL AND THEIR PRODUCTS.

The iron and steel industry is the backbone of war-implement manufacture. In addition to the plants already prepared, by the nature of their peace-time product, to make weapons of warfare, those that previously made vaults, safes, radiators, and structural ironwork produced bombs, grenades, firearms, or heavy artillery. Factories that had turned out small machines, like sewing machines or computing machines, helped on smaller parts of shells, gun sights, optical goods, or scientific instruments. Table 10 shows for the various branches of this basic industry the changes in the labor force between February and October, 1918, the extent of substitution, and the increase in the number of women without substitution. In every one of the 15 branches shown in the table, the proportion of women in firms reporting for both periods increased materially. For the industry as a whole only 61 women were employed in each 1,000 wage earners after the first draft, while after the second draft the proportion had risen to 95 in every 1,000 for the same 2,121 plants and to 110 if 16 additional plants reporting only in the second period were included. Less than half the plants employed women, however, and less than half the plants employing women substituted them on men's work. The per cent of women substituted taken in relation to the entire number of women employed in the industry is 32, while the proportion which they form of women employed in plants in which substitution occurred is 46 per cent. This indicates that in firms where substitutions took place nearly one-half of all the women on their labor force were replacing men or doing work formerly done only by men. Only 214, or about 10 per cent, of all iron and steel firms included in the survey increased the number of women without any substitution.

TABLE 10.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS IN THE IRON AND STEEL INDUSTRY, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Crude iron and steel rolled products	93	49,022	48,670	48,423	47,694	599	976	12	20	41	22	862	425	4	47	18
Cutlery and tools, saws and files	283	29,841	30,902	26,279	25,735	3,562	5,167	119	167	142	67	2,965	1,135	29	1,773	510
	[1 1]		2,478		2,220		258		104	1	1	258	19			
Engines and pumps	98	18,050	19,782	17,630	18,462	420	1,320	23	67	54	25	1,202	836	17	95	30
Firearms and ammunition	74	55,167	81,369	47,150	67,798	8,017	13,571	145	168	58	28	10,843	2,862	20	1,820	1,701
	[1 14]		112,899		93,151		19,748		175	14	7	11,362	6,604			
Foundry and machine-shop products [2]	1,175	175,277	182,697	169,768	171,646	5,509	11,051	31	60	491	187	7,794	4,513	102	2,307	1,383
Hardware	102	19,326	18,699	16,415	15,262	2,911	3,437	151	184	75	29	2,061	677	18	693	64
Locomotives	4	5,231	5,046	5,229	5,043	2	3	[3]	[3]	1				1	3	1
Machines for office and home use [4]	30	10,519	10,224	8,684	6,916	1,835	3,308	174	324	27	17	3,063	1,457	7	225	125
Safes and vaults	7	256	239	254	236	2	3	8	13	2	1	1	1			
Scales and balances	9	829	763	812	728	17	35	21	46	5	4	33	20			
Springs, steel car and carriage	26	1,799	1,876	1,624	1,543	175	333	97	176	14	6	205	53	3	91	78
Stoves and furnaces	88	9,455	7,956	9,214	7,572	241	384	25	48	40	14	294	113	7	34	30
Structural-iron work, including doors and shutters	81	6,760	7,125	6,745	7,072	15	53	2	7	12	4	37	37	1	1	1
Tin plate and terneplate	6	6,780	7,863	6,544	7,544	236	319	35	41	6	4	303	128	1	11	1
	[1 1]		7,100		7,000		100		14	1	1	100	79			
Wire and wirework	48	5,944	6,166	5,537	5,538	407	628	68	102	27	13	507	212	4	61	35
Total for plants reporting after both first and second drafts	2,124	394,256	429,377	370,308	388,789	23,948	40,588	61	95	995	421	30,170	12,469	214	7,161	3,977
Total for all plants, including 16 reporting after second draft only	2,140	.....	551,854	.....	491,160	.....	60,694	.....	110	1,011	430	41,890	19,171	.....	.....	.....

[1] When figures are bracketed, the lower one represents firms reporting after the second draft only.

[2] Includes boilers, tanks, cast shapes, forged parts, wheels, frogs, machines and machinery, bearings, valves, plumbers' supplies, metal patterns, and jobbing machine-shop work. The proportion of women employed in the manufacture of these products varies considerably—23 in every 1,000 wage earners for the first period and 37 for the second period in the making of simple foundry products, such as cast shapes and forged parts; 9 in every 1,000 for the first and 24 for the second period in making boilers and tanks; 32 in every 1,000 for the first and 76 in every 1,000 for the second period in the making of machines and machinery; and 67 in every 1,000 for the first and 110 in the second period in the making of such products as valves, bearings, and plumbers' supplies.

[3] Less than one in every 1,000 wage earners.

[4] Includes such small machines as cash registers, computing machines, typewriters, and sewing machines.

METAL AND METAL PRODUCTS OTHER THAN IRON AND STEEL.

Closely allied to and of equal importance with iron and steel products are the products made from other metals. These are all obviously war supporting in nature. The jewelry, silverware, watch and clock firms not only supplied the fighters with wrist watches, clocks, identification tags, and eating utensils, but in addition made parts of gas masks, surgical instruments, small gears for bombs, insignia, Navy speaking apparatus, optical goods, as well as offensive and defensive grenades and shells. Table 11 gives the facts on changes in the labor force for 19 branches of the metal trades. All branches, with one unimportant exception, showed an increase in the proportion of women employed. The largest numbers were employed in the manufacture of brass, bronze, and copper products, of clocks and watches, and of tinware. The largest proportions were found in the last two industries and in the making of jewelry, of needles, pins, and hooks and eyes, and of stamped and enameled ware. In all these women formed more than a fourth of the entire force. The smallest proportion of women was found in the smelting and refining of various metals and in galvanizing. Substitution was most extensive in the making of aluminum ware; of metal furniture and office fixtures; of gas and electric fixtures; and copper, tin, and sheet-iron work; but these industries all employed a comparatively small force of women. Substitution of women was less extensive in these metal trades than in the iron and steel industry, but a larger proportion of women was to be found in them than in the making of iron and steel products.

TABLE 11.—MEN AND WOMEN EMPLOYED

TABLE 11.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF METAL PRODUCTS, OTHER THAN IRON AND STEEL, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Aluminum ware	15	8,766	9,207	8,096	8,408	670	799	76	87	11	7	646	523	1	67	2
Babbitt metal and solder	8	597	571	561	522	36	49	60	86	3				2	47	13
Brass, bronze, and copper products	184	32,744	35,683	28,956	29,817	3,788	5,866	116	164	86	42	5,469	1,541	17	205	90
Clocks and watches, including cases and materials	18	10,419	9,800	6,352	5,622	4,067	4,178	390	426	16	9	3,366	308	3	303	36
Copper, tin, and sheet-iron work	168	11,109	10,974	10,295	10,016	814	958	73	87	66	18	397	159	11	282	90
Electroplating	17	301	279	288	256	13	23	43	82	5	1	10	8	1	7	1
Galvanizing	9	273	285	271	281	2	4	7	14	3	1	2	1			
Gas and electric fixtures, including lamps and reflectors	40	4,010	4,127	3,434	3,402	576	725	144	176	29	9	448	152	3	89	41
Gold and silver leaf and foil	5	97	107	48	57	49	50	51	47	5	1	7	2	2	31	7
Jewelry	209	9,008	6,533	6,617	4,179	2,391	2,354	265	360	181	48	1,230	218	29	420	117
Lead, bar, pipe, and sheet	2	89	97	89	97											
Metal furniture and office fixtures	28	5,035	5,695	4,906	5,357	129	338	27	59	14	8	320	251	1	5	1
Needles, pins, hooks and eyes	13	3,082	3,043	1,566	1,443	1,516	1,600	492	526	12	2	1,139	14	6	364	51
Silversmithing and silver and plated ware	43	6,715	6,095	5,422	4,787	1,293	1,308	193	215	36	13	802	62	4	385	165
Smelting and refining copper	13	11,989	10,966	11,950	10,899	39	67	3	6	7	4	61	31			
Smelting and refining lead	9	3,112	2,510	3,110	2,501	2	9	(1)	4	3				3	9	7
Smelting and refining zinc	17	10,034	9,295	9,985	9,139	49	156	5	17	3	3	156	93			
Stamped and enameled ware	34	4,493	4,579	3,451	3,248	1,042	1,331	232	291	28	15	849	129	4	114	36
Tinware, not elsewhere specified	64	10,971	9,922	7,664	6,587	3,307	3,335	301	336	50	23	1,593	260	12	894	172
Total	896	132,844	129,768	113,061	106,618	19,783	23,150	149	178	558	204	16,495	3,752	99	3,222	829

[1] Less than 1 in every 1,000 wage earners.

LUMBER AND ITS REMANUFACTURES.

Lumber contributed to the war materials for ships, airplanes, and construction work. Furniture, veneer, and wood-turning plants did special work for airplanes and made saddletrees. These were all industries in which women had been little employed in prewar days. During the war, however, they made decided gains. In furniture plants, for example, the proportion of women rose from 55 per 1,000 wage earners after the first draft to 140 after the second draft. For the industry as a whole the proportion of women more than doubled between these two periods, but even so women did not reach the proportionate importance which they attained in either iron and steel or the other metal trades. The proportion of substitutions, however, was much higher for the lumber industry. Two of the most important branches of the industry—furniture and lumber products from saw and planing mills—showed also the highest proportion of women replacing men, 63 per cent and 77 per cent, respectively. The proportion of women substituted for the whole industry was 455 per 1,000 women employed. The lumber industry and the metal trades had approximately the same proportion of firms employing women—slightly over three-fifths—while the iron and steel industry fell behind them with less than half. Table 12 shows the figures for the lumber industry.

TABLE 12.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE AND REMANUFACTURE OF LUMBER, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.								Total firms employing women.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Baskets and rattan and willow ware	24	1,439	1,230	1,055	850	384	380	267	309	21	8	165	51	6	85	26
Boxes, cigar and fancy	25	1,220	1,088	623	555	597	533	49	49	25	3	86	4	4	98	16
Boxes, wooden packing	102	9,615	9,879	9,114	8,840	501	1,039	52	105	64	38	891	543	8	75	38
Charcoal	1	391	344	387	337	4	7	10	20	1				1	7	3
Coffins, burial cases, and undertakers' goods	27	1,698	1,729	1,388	1,390	310	339	183	196	26	11	117	68	3	18	4
Cooperage	49	4,569	4,217	4,245	3,751	324	466	71	111	31	17	260	194	1	1	1
Cork cutting[1]	10	1,398	1,263	664	624	734	639	525	506	10	4	127	14	1	8	2
Furniture and refrigerators[2]	209	31,584	27,841	29,836	23,941	1,748	3,900	55	140	227	159	3,484	2,203	20	156	93
Lumber and timber products from saw and planing mills and logging establishments	703	92,267	84,073	90,998	80,042	1,269	4,031	14	48	367	187	3,075	2,362	53	595	448
Matches	5	1,215	944	919	669	296	275	244	291	5	3	101	35	1	14	4
Miscellaneous wooden goods, not elsewhere specified	28	2,523	2,471	1,933	1,646	590	825	234	334	23	13	757	219	1	22	3
Pulp goods	14	2,045	2,122	1,757	1,733	288	389	141	183	11	2	172	42	4	127	108
Wood preserving	4	232	232	232	232											
Wood turned and carved	61	4,300	4,845	4,161	4,343	139	502	32	104	35	25	423	331	4	52	15
Total	1,352	154,496	142,278	147,312	128,953	7,184	13,325	46	94	846	470	9,658	6,066	107	1,258	761

[1] Includes life preservers.

[2] Includes show cases, billiard tables, and mirror and picture frames.

CHEMICAL PRODUCTS.

The war made unusually heavy drafts upon the chemical resources of the country, for on them depended the supply of explosives. This demand became acute with the shutting off of importations. Toluol, from which T. N. T. is made, was most needed. The supply from coke ovens of steel companies was insufficient, so illuminating gas was stripped of this property in 13 of the leading cities of the country.[13] This reduced the lighting power of gas by over 25 per cent and the heating power by 6 per cent. Carbon for gas masks was found in the most concentrated form in coconut and other nut shells and in the pits of peaches, plums, and cherries. This was the reason for the collection of all shells and seeds to be used for gas defenses.

Women were successful in making substantial inroads into the chemical industry. Their proportion in the industry increased from 98 in every 1,000 after the first draft to 140 in every 1,000 after the second draft. Over three-fourths of the firms included women in their labor force. This is a larger proportion than any of the three other large war agent and implement industries already considered. The proportion of substitutions in the chemical industry is approximately the same as for the metal trades, and is smaller than in iron and steel or lumber products. In the manufacture of explosives, the most important of the chemical industries, women took an increasingly significant part. After the first draft they formed nearly 14 per cent of the working force and after the second draft the percentage had risen to over 23 in the same plants. The extent of substitution in these firms, however, was rather low, only 26 per cent of the women employed being used in men's work. The manufacture of druggists' preparations, patent medicines and the like, and of blacking, cleaning, and polishing preparations had the highest proportion of women, each having more than half the force made up of women. The manufacture of coke, wood distillations, fertilizers, and petroleum refining all had a very small percentage of women. The figures for the chemical industry are given in Table 13.

[13] America's Munitions, 1917–18. Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions. Washington, 1919, p. 107.

TABLE 13.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS, AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF CHEMICALS AND ALLIED PRODUCTS, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Baking powder and yeast	3	586	518	409	390	177	128	302	247	3	1	119	2	1	2	1
Blacking, cleaning, and polishing preparations	18	714	742	366	365	348	377	487	508	15	5	298	34	1	41	8
Bone, carbon, and lampblack	8	587	701	570	661	17	40	29	57	4	2	37	33	.....	.....	.....
Chemicals and acids	71	16,477	16,210	15,336	14,749	1,141	1,461	69	90	47	13	375	149	17	767	206
	[1] 1	.....	300	.....	290	.....	10	.....	33	1	1	10	6	.....	.....	.....
Coke	8	1,337	1,102	1,327	1,087	10	15	7	14	2	1	1	1	1	14	4
Drug grinding	2	52	49	50	47	2	2	38	41	1	.....	.....	.....	.....	.....	.....
Druggists' preparations, patent medicines, perfumery, and cosmetics	147	5,480	5,999	2,793	2,774	2,687	3,225	490	538	144	28	1,136	198	52	1,430	441
	[1] 1	.....	850	.....	350	.....	500	.....	588	1	1	500	4	.....	.....	.....
Dyestuffs, extracts, and bluing	44	5,857	5,950	5,625	5,473	232	477	40	80	25	10	345	235	9	107	41
Explosives and fireworks	23	8,242	9,276	7,098	7,140	1,144	2,136	139	230	18	10	1,378	365	3	732	635
	[1] 2	.....	72,359	.....	62,839	.....	9,520	.....	132	2	2	9,520	1,154	.....	.....	.....
Fertilizers	28	4,596	2,574	4,543	2,411	53	163	12	63	13	8	115	115	2	5	2
Gas, illuminating and heating	48	4,821	4,542	4,494	4,108	327	434	68	96	41	19	245	77	9	158	37
Grease, tallow, soap, candles, and glue	70	7,065	8,129	5,600	5,988	1,465	2,141	207	263	60	18	1,779	242	10	164	36
Ink, printing and writing	17	979	966	888	855	91	111	93	115	12	5	27	20	1	35	6
Oils	77	5,428	5,730	5,237	5,262	191	468	35	82	45	29	303	286	8	101	60
Paints and varnishes	69	3,697	3,458	3,174	2,930	523	528	141	153	57	21	284	70	10	168	14
Petroleum refining	79	23,448	24,305	22,951	22,910	497	1,395	21	57	59	28	1,300	751	10	40	21
Salt	7	1,040	1,234	938	1,130	72	104	69	84	6	3	77	8	2	22	9
Wood distillation, not including turpentine and rosin	14	1,476	1,540	1,467	1,515	9	25	6	16	1	.....	.....	.....	1	25	16
Total for plants reporting after both first and second drafts	733	91,882	93,025	82,896	79,795	8,986	13,230	98	142	553	201	7,819	2,586	137	3,751	1,537
Total for all plants, including 4 reporting after second draft only	737	.....	166,534	.....	143,274	.....	23,260	.....	140	557	205	17,849	3,750	.....	.....	.....

[1] When figures are bracketed the lower one represents firms reporting for the second period only.

LEATHER AND ITS FINISHED PRODUCTS.

The dependence of civilian life on leather supplies is an index to the need of the same products to equip the Army and Navy. The boot and shoe industry and other branches in which finished leather products are made have long been important employers of woman labor. In the more important branches of the leather industry the proportion of women employed in plants reporting for this survey after the second draft ranged from one-third to two-thirds of the entire force. The proportion of women increased somewhat between the first and second drafts even in these branches, though this increase was due rather to a falling off in the number of men than an addition to the actual number of women employed. It was in the tanning, currying, and finishing of the raw leather hides that women had not been employed to any extent before the war. That they made some inroads into this branch of the industry during the war is evidenced by the increase in the proportion of women employed from 70 in every 1,000 wage earners in the labor force to 105 in every 1,000. This resulted from an increase of over 44 per cent in the number of women employed. In this branch of the industry was found the highest proportion of substitution—42 per cent in comparison to 12 per cent for boots and shoes, 6 per cent for gloves, and 25 per cent for other leather goods. This fact was doubtless due to the newness of this branch of the industry to women. Table 14 presents the figures for the manufacture of leather and its products.

TABLE 14—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS IN THE LEATHER INDUSTRY, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.							
		Total.		Men.		Women.			
						Actual number.		Number per 1,000 wage earners.	
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.
Boots and shoes	272	61,315	57,572	37,556	34,196	23,759	23,376	384	406
Gloves and mittens, leather	127	9,918	9,372	3,597	3,173	6,321	6,199	637	661
Leather, tanned, curried, and finished	185	29,207	28,083	27,163	25,128	2,044	2,955	70	105
Leather belting	21	1,922	1,129	1,635	980	287	149	149	132
Leather goods, not elsewhere specified	161	8,269	7,575	5,952	5,100	2,317	2,475	280	327
Saddlery and harness	44	3,476	3,903	3,182	3,544	294	359	85	92
Total	810	114,107	107,634	79,085	72,121	35,022	35,513	307	330

TABLE 14—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS IN THE LEATHER INDUSTRY, BY BRANCH OF INDUSTRY—Continued.

Branch of industry.	Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Boots and shoes	267	121	18,558	2,208	62	2,420	455
Gloves and mittens, leather	127	14	1,313	86	36	2,104	576
Leather, tanned, curried, and finished	110	47	2,248	942	25	392	183
Leather belting	16	4	45	37	3	52	22
Leather goods, not elsewhere specified	157	35	778	192	45	914	322
Saddlery and harness	34	10	211	86	9	80	63
Total	711	231	23,153	3,551	180	5,962	1,621

STONE, CLAY, AND GLASS PRODUCTS.

The erection of new factories, embarkation piers, storage warehouses, and camps utilized all kinds of building materials, both raw and manufactured. Glass for war buildings, optical and scientific instruments, and medicine bottles was needed in extra quantities. Women had never been extensively employed in any branch of this industry except the pottery trade, but during the war the glass industry revealed a considerable increase in the number of women, and even the manufacture of stone products and of clay products, other than pottery, showed some accessions of women to the force. These additions were almost entirely replacements of men or on men's work. These facts are shown in Table 15

TABLE 15.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF STONE, CLAY, AND GLASS PRODUCTS, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.							
		Total.		Men.		Women.			
						Actual number.		Number per 1,000 wage earners.	
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.
Clay products other than pottery	96	7,808	6,714	7,736	6,528	72	186	9	28
Glass	127	20,659	17,103	17,732	13,642	2,927	3,461	142	202
Pottery	28	4,571	4,393	3,227	3,001	1,344	1,352	294	317
Stone products	71	5,642	5,259	5,544	5,101	98	158	17	30
Total	322	38,680	33,469	34,239	28,272	4,441	5,197	115	155

Branch of industry.	Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Clay products other than pottery	35	14	140	134	3	17	1
Glass	114	41	2,285	815	20	682	157
Pottery	28	11	1,091	63	3	29	19
Stone products	34	7	82	80	4	13	11
Total	211	73	3,598	1,092	30	741	188

TEXTILES AND THEIR PRODUCTS.

The word "textiles" carries with it usually the meaning of material for clothing. But the war demanded in addition to the clothing for soldiers and canvas for tents thousands of yards of silk for bags to hold the loads of smokeless powder, light-weight silk for parachutes to float airplane flares; silk, linen, and cotton for airplane wings; and "sandwich" cloth for balloons. This material was made not only three-ply, but the middle section was rubberized by being run through the spreading machines thirty to thirty-five times in order to prevent tears and build up a texture strong enough to resist the seepage of gas. "America's Munitions, 1917–18," states in regard to textile fabric needs:

> Over 100,000,000 yards of denim were bought * * * gauze, about 140,000,000 yards were purchased; sheets and pillowcases were required in such quantities that at one time every mill in the country whose normal business was the production of sheeting was working for the Government. There were over 120,000,000 yards of webbing purchased and nearly 300,000,000 yards of the various kinds of duck.[14]

[14] America's Munitions, 1917-18. Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions. Washington, 1919, p. 468.

Textile equipments for the Army, other than clothing, overcoats, hats, underclothes, socks, blankets, gauze, towels, etc., included haversacks, cartridge belts, bandoleers, pack carriers, pistol holsters, canteen covers, suspenders, buckets, basins, coal and mail bags, gun slings, tents, barrack bags, and covers for tools. The requirements for cotton duck and cotton webbing drew on all the mills normally producing webbing and turned into webbing mills factories that had been making carpets, lace, tire fabrics, asbestos, brake linings, hose, lamp wicks, suspenders, garters, neckties, cotton belting, and similar fabrics. Webbing materials were substituted as much as possible for leather. After the webbing was secured, heavy sewing machines had to be built, especially adapted for textile equipment work, the experts teaching the workers, mostly women, how to make haversacks, cartridge belts, etc. Overall factories used denim and dyed twilled materials for clothes for soldiers, women's underwear factories made underclothes for men, and corset factories also made men's underwear, as well as powder bags for loading plants. The rope and twine factories produced almost entirely ropes, hawsers, and cables for airplanes, balloons, submarines, and ships.

In this group of industries woman workers had established previous to the war a stronger foothold than in any other. Table 16 shows for the period between the first and second drafts an actual numerical decrease in women employed in nearly all branches of this industrial group; but, because of an even larger decrease in the force of men, women assumed a greater relative importance in the labor force as a whole. Because of the many occupations already open to women, the proportion of substitutions in the manufacture of textiles and their products is very low. Only 27 in each 1,000 women employed in these industries were engaged on men's work. While 99.3 per cent of the firms in these industries employed women, only 17.6 per cent were using women on work formerly done by men.

TABLE 16.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF TEXTILES AND THEIR PRODUCTS, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Cotton goods	308	105,472	98,069	59,407	53,681	46,065	44,388	437	453	308	115	23,739	2,234	46	4,446	471
Woolen and worsted goods	244	68,020	62,113	37,722	34,591	30,298	27,522	445	443	239	78	7,928	715	49	2,588	2,916
Silk and silk goods	130	23,753	21,442	9,784	8,636	13,969	12,806	588	597	129	49	6,192	469	29	1,712	250
Hosiery and knit goods	346	55,331	50,120	16,701	15,459	38,630	34,661	698	692	346	70	8,664	545	68	5,491	712
Cordage, twine, jute, and linen goods	63	10,669	8,750	6,176	4,907	4,493	3,843	421	439	62	19	1,290	147	9	406	112
Dyeing and finishing textiles	63	11,833	10,866	9,141	8,298	2,692	2,568	228	236	58	24	1,451	333	7	195	59
Lace goods and curtains	44	3,573	3,109	1,383	1,138	2,190	1,971	613	634	44	9	698	41	12	380	69
Suits and coats, men's	371	30,258	26,990	15,325	13,530	14,933	13,460	493	499	366	55	4,119	191	56	2,964	698
Suits and coats, women's	341	10,607	8,097	7,113	5,310	3,494	2,787	329	344	337	12	67	23	47	728	201
Shirts, collars, and working clothes	281	26,743	22,683	4,781	4,036	21,962	18,647	821	822	281	43	5,249	181	64	3,424	721
Furnishing goods, men's	119	16,130	11,710	3,382	3,579	6,748	8,131	666	694	119	12	5,292	145	26	993	173
Muslin underwear, waists, women's and children's dresses	593	28,544	23,872	4,721	3,878	23,823	19,994	835	838	592	32	2,037	78	127	5,839	1,232
Corsets	24	4,538	4,152	507	442	4,031	3,710	888	894	24	6	2,585	89	4	200	22
Dressmaking and dressmakers' supplies	185	5,554	4,886	1,367	1,192	4,187	3,694	754	756	185	9	402	24	36	1,156	248
Oilcloth and linoleum	2	204	200	187	159	17	41	84	205	2	2	41	24	.....	.....	.....
Other textile and allied industries[1]	192	16,120	15,013	7,778	6,671	8,342	8,342	517	556	191	47	3,876	278	46	2,749	480
Total	3,306	411,349	372,072	185,475	165,507	225,874	206,565	549	555	3,283	582	73,630	5,517	626	33,271	8,364

[1]Includes manufacture of awnings, tents, sails, bags, horse clothing, flags, etc.

FOOD, FOOD PRODUCTS, AND BEVERAGES.

No explanatory remarks are necessary to couple these industries with the war. The extract from the report of the Director of Munitions quoted in Section I of this report describes vividly the tremendous demands which the task of feeding the Army made on our food industries.[15] In addition to these requirements the needs of the civilian population had to be met. As a consequence, practically every branch of the manufacture of food products increased its labor force as a whole. The only important exceptions were the confectionery industry, whose product was generally accepted as a luxury of prewar days, and the sugar industry, the shortage of whose product has been felt even in reconstruction days. In the manufacture of beverages, makers of alcoholic liquors, numerically the most important branch, decreased their force, but this was doubtless due to the artificial limitations of war-time prohibition, rather than the natural play of supply and demand. Soft-drink manufacturers, on the other hand, increased their force. But despite occasional decreases in the labor force as a whole, the proportion of women employed increased in each of the various branches of the manufacture of food and beverages. The proportion of women employed after the second draft varied from 21 in every 1,000 at work in the making of alcoholic beverages to 591 in every 1,000 employed in the manufacture of confectionery, cocoa, and chocolate. In all but one branch of the food industries women workers formed more than one in every eight on the labor force. The manufacture of beverages showed a much higher proportion of substitutions than the food industries, while the latter exceeded the textile industries in the extent to which women took men's places. Food products manufacture has always employed a considerable proportion of women, however, so that there were comparatively few new occupations into which they might be introduced.

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[15] See p. 14.

TABLE 17.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF FOOD PRODUCTS, BEVERAGES, AND ALLIED PRODUCTS, BY BRANCH OF INDUSTRY

Branch of industry.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Bread and bakery products	183	13,916	14,980	9,189	9,023	4,727	5,957	344	396	171	61	4,110	385	33	1,208	383
Butter, cheese, and condensed milk	223	11,820	12,732	10,107	10,600	1,713	2,132	145	167	209	76	1,179	336	58	571	203
Coffee and spices	61	2,583	2,721	1,355	1,339	1,228	1,382	475	508	60	20	707	76	14	217	99
Confectionery, cocoa, and chocolate	289	26,100	23,709	11,253	9,697	14,847	14,012	569	591	282	88	6,145	359	55	3,789	947
Cordials, sirups and flavoring extracts	29	888	874	601	592	287	282	323	323	27	9	168	28	8	98	51
Flour-mill and gristmill products	241	10,501	11,951	9,510	10,426	991	1,525	94	128	182	69	873	287	40	518	184
Food preparations, including starch and glucose	102	10,706	12,140	7,679	8,280	3,027	3,860	283	318	99	22	987	178	30	2,445	839
Lard and oleomargarine	11	743	786	672	600	71	186	96	237	8	3	114	80	2	54	8
Slaughtering and meat packing	95	62,442	73,459	55,361	62,006	7,081	11,453	113	156	78	42	8,313	1,179	17	2,500	863
Sugar, beet and cane	15	5,791	4,955	5,524	4,598	267	357	46	72	11	4	279	146	3	16	7
Vinegar	9	80	274	79	231	1	43	13	157	5	1	1	1	3	41	41
Total for food products	1,258	145,570	158,581	111,330	117,392	34,240	41,189	235	260	1,132	395	22,876	3,055	263	11,457	3,625
Alcoholic beverages	179	14,607	12,125	14,417	11,870	190	255	13	21	74	20	94	60	7	55	21
Ice	45	2,045	2,222	2,006	2,168	39	54	19	24	22	6	29	10	8	12	9
Soft drinks	90	1,892	1,910	1,768	1,713	124	197	66	103	67	25	112	74	8	39	16
Total for beverages	314	18,544	16,257	18,191	15,751	353	506	19	31	163	51	235	144	23	106	46
Grand total	1,572	164,114	174,838	129,521	133,143	34,593	41,695	211	238	1,295	446	23,111	3,199	286	11,563	3,671

TOBACCO INDUSTRY.

As tobacco was included among the rations provided by the Army to the soldiers, the output of the tobacco factories became a war-supply industry. This is one of the industries in which women have always played an important part. The proportion of substitutions, therefore, was very low, lower than in the food industries, but slightly larger than in the manufacture of textiles and their products. But even this traditional employer of woman workers showed a slight increase in the proportion of women employed in the total labor force between the first and second drafts. Only about 6 per cent of the firms did not employ women, and, judging from the fact that they were small and were altogether in the cigar and cigarette industry, they were doubtless often the so-called "buckeye" shops which employ only one or two workers, always men who understand the complete process of creating a hand-made cigar, whereas women are used in the larger plants when the process is subdivided.

TABLE 18.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS IN THE TOBACCO INDUSTRY, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.							
		Total.		Men.		Women.			
						Actual number.		Number per 1,000 wage earners.	
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.
Chewing and smoking tobacco and snuff	31	8,345	6,388	3,919	2,786	4,426	3,602	530	564
Cigars and cigarettes	347	32,003	28,491	13,571	11,848	18,432	16,643	577	584
Total	378	40,348	34,879	17,490	14,634	22,858	20,245	566	580

Branch of industry.	Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Chewing and smoking tobacco and snuff	31	13	2,288	313	4	375	224
Cigars and cigarettes	326	51	4,793	297	52	2,731	763
Total	357	64	7,081	610	56	3,106	987

PAPER AND PAPER GOODS.

Paper containers for overseas shipment of food, clothing, etc., increased the use of paper enormously, as also did the quantities used in spreading public information. In the manufacture of paper goods, especially paper boxes, women have long been employed.

In the making of paper itself, however, they are newcomers. Among the firms covered in this industry in the course of the present survey, 92 per cent of those manufacturing paper products employed women as compared with 73 per cent of those producing paper and paper pulp. As shown in Table 19, however, the force of women engaged in the paper and paper-pulp industry increased nearly a fifth, 19.4 per cent, during the war period as compared with 1.4 per cent in miscellaneous paper goods. The proportion of women employed in paper making, nevertheless, did not reach a high figure; after the first draft they numbered 71 in every 1,000 wage earners, and after the second draft, 92 in every 1,000. In making paper goods, on the other hand, there were 423 women in every 1,000 employed after the first draft and 432 in every 1,000 after the second. As a consequence of the comparative headway made by women in the two industries, substitutions of women on men's work were relatively more numerous in the making of paper itself than of paper goods, although a larger proportion of firms substituted women on paper goods than in making paper. At best, however, replacement of men by women in these industries was slight in amount.

TABLE 19.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF PAPER AND PAPER GOODS, BY BRANCH OF INDUSTRY.

Branch of industry	Total firms reporting.	Labor force.							
		Total.		Men.		Women.			
						Actual number.		Number per 1,000 wage earners.	
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.
Paper and paper pulp	182	35,415	34,462	32,772	31,307	2,643	3,155	71	92
Miscellaneous paper goods	369	25,363	25,160	14,645	14,287	10,718	10,873	423	432
Total	551	60,778	59,622	47,417	45,594	13,361	14,028	220	235

Branch of industry.	Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Paper and paper pulp	133	29	1,194	232	44	1,190	293
Miscellaneous paper goods	341	95	5,016	685	75	2,351	467
Total	474	124	6,210	917	119	3,541	760

PRINTING, PUBLISHING, AND ENGRAVING INDUSTRIES.

In the allied industries of printing, publishing, and engraving substitution was even less frequent. Women have always been employed to a certain extent in printing shops, and even more ex-

tensively in bookbinding, which is a part of the publishing business. During the war, according to the plants covered in this survey, the proportion of women increased somewhat. The printing and publishing firms employed from 254 to 279 women per 1,000 wage-earners, while the engraving shops had a proportion of only 94 to 132 per 1,000. These industries suffered a slight decrease during the war in their force as a whole but increased their number of women.

TABLE 20—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS, AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS IN THE PRINTING, PUBLISHING, AND ENGRAVING INDUSTRIES, BY BRANCH OF INDUSTRY.

Branch of industry.	Total firms reporting.	Labor force.							
		Total.		Men.		Women.			
						Actual number.		Number per 1,000 wage earners.	
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.
Printing and publishing	654	47,301	44,577	35,282	32,120	12,019	12,457	254	279
Engraving and diesinking	51	2,201	2,041	1,995	1,771	206	270	94	132
Total	705	49,502	46,618	37,277	33,891	12,225	12,727	247	273

Branch of industry.	Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Printing and publishing	554	188	7,109	814	90	1,774	348
Engraving and diesinking	25	6	178	38	7	61	15
Total	579	194	7,287	852	97	1,835	363

OTHER WAR INDUSTRIES.

The war agent and implement and war food and fabric industries which employed women in largest numbers during the war have been shown by their detailed branches in the preceding tables. A large number of industries remain, both important ones and those of lesser consequence, whose product is sufficiently uniform to make division into branches without significance. The same facts for these industries, 21 in number, as have been given in the 11 preceding tables for certain leading industries are presented in Table 21, page 78. War agent and implement industries of considerable importance which are included in this table are the manufacture of agricultural implements, airplanes, automobiles, electrical machinery and supplies, and shipbuilding. Other important branches belong to the war food and fabric industries; and all major or minor industries included had a distinct contribution to make to the war.

Agricultural implements.—Agricultural implement factories were well equipped to do heavy work on trailers, tractors, tanks, and trucks. The world's pressing need for food, however, did not permit all the plowshares to be melted into swords. In addition to furnishing enough implements to make possible extra food production, these factories also made shells, grenades, rifles, infantry guns, and all kinds of special ordnance. At no time during the war did this industry, according to the facts secured in this survey, become a large employer of women. The number of women employed in the 116 plants covered increased 170 per cent between the first and second drafts, but even after this huge increase the proportion of women was only 43 in every 1,000 employed. Not quite half the plants had women on their labor force at all, and only one-quarter were substituting them on men's work. For this small group of firms in which substitution occurred 76 per cent of the women employed were engaged on men's work, while 56 per cent of the entire number of women in all firms included were thus substituted. In comparison with many other industries these represent a high proportion of substitutions.

Airplanes.—The connection of the airplane industry with war demands is obvious. It, probably more than any other one industry, was a child of war needs. As has already been shown in an earlier table,[15] the 1914 Census of Manufactures found in its country-wide canvass only 16 plants making airplanes, with a force of 211 workers. This study alone covered 40 plants, with 26,470 workers, in the year 1918. In so new an industry, created at a time when male labor was scarce, women made more headway than in some of the older war implement industries. Certain tasks, such as the work on airplane wings, seemed well suited to women's deft fingers. In February, 1918, women constituted 169 of each 1,000 workers employed in 31 plants reporting at that time, and 186 in each 1,000 in the same plants some eight months later. If six additional plants reporting only at the second period are included, they formed 231 of each 1,000 of the working force. In spite of the newness of the industry the proportion of substitutions was rather high, nearly 60 per cent of women employed in all plants covered being used on men's work.

Automobiles.—The automobile industry not only supplied motor vehicles for the war, such as cars, trucks, ambulances, and tractors, but extended its activities to include tanks, trailers, rolling kitchens and laundries, grenades, seacoast guns, recuperators, shells, and practically every kind of ordnance work. During the war the force of women, in the automobile plants covered in this study, more than tripled, and the proportion of women in the total force rose between the first and second drafts from 44 to 114 in every 1,000 employed. This is not a large proportion, but the increases indicate that many new opportunities were opened to women in this industry during the war. The proportion of substitutions was also high in the automobile industry, 60 per cent of the women employed being engaged on men's work.

Electrical machinery.—The part which the electrical machinery industry played in the war is fully described later in the critical analysis of substitution of women in men's places.[16] It was one of the few

[15] Table 6, p. 47.

[16] See p. 113.

machinery trades which before the war employed women to any considerable extent. During the war 172 plants in this industry employed 214 women per 1,000 on their labor force after the first draft and 269 per 1,000 after the second draft. This proportion exceeds that already shown for the iron and steel industry and the metal trades.[17] In proportion of substitutions the manufacture of electrical machinery and supplies slightly exceeded the metal trades but fell behind the iron and steel industry.

Shipbuilding.—Shipbuilding was, of course, of tremendous importance to the war, and, as every one knows, experienced a mushroom-like expansion. From the nature of the work involved, however, it was not adapted to the extensive introduction of woman workers. That this was the case is borne out by the figures for this industry shown in Table 21, the per cent of woman workers varying in the reports for different periods and groups from six-tenths of 1 per cent to 1.1 per cent. Only about one-third of the firms employed women at all, and the majority of women in the industry were employed in those few plants which attempted substitutions.

Rubber goods.—The manufacture of rubber goods belongs to the class of war food and fabric rather than war implement industries. It was important, both from the point of view of war needs and of new industrial opportunities for women. The demand for rubber clothing for the Army and Navy necessitated the buying of practically the entire output of rubber boot factories. Ponchos and raincoats were manufactured almost exclusively for the Government. The rubber factories were also the principal makers of balloons and gas mask parts, as well as of automobile and truck tires. Out of the 23,987 workers employed in 80 rubber plants after the first draft, 6,633 were women, a proportion of 276 in every 1,000 employed. After the second draft the proportion had risen in the same plants to 354 per 1,000. Over 90 per cent of the firms employed women after the second draft and over 40 per cent substituted them on men's jobs. The proportion of woman workers actually engaged on men's work, however, was small.

Vehicles other than automobiles.—The manufacturers of street and steam railway cars and the railroad repair shops not only served the war by continuing civilian work, but added to their product signal corps wagons, trucks for guns, ammunition cars, railway trucks, and airplanes. The output of carriage and wagon plants was transformed to meet war needs by making trench carts, rolling kitchens, pigeon wagons, supply wagons, bodies and wheels for motor vehicles, trailers, and even some parts of shells. As in these other industries, plants in the motor cycle and bicycle industry were also ready to supply war vehicles, and were equipped to make parts or the whole of munitions and warfare implements. This industry showed the highest proportion of substitutions of women on men's work during the war of any covered in this investigation. The actual number of women employed, however, was small. The carriage and wagon plants and the car and railroad repair shops also had less than 10 per cent of women on their labor force. The proportion of substitutions was not high for any of these branches except the car shops, in which 665 per 1,000 women employed were replacing men.

[17] Table 10, p. 57 and Table 11, p. 59.

Motion picture and photographic apparatus.—Too great importance can not be assigned to the war contribution of the makers of motion picture and photographic apparatus, materials, and supplies. Aerial photography was one of the leading activities of the air service. Constant research work and experiments along this line were necessary to insure every improvement that could facilitate this activity. With the manufacture of lenses and new methods of development, were coupled the equally important problems of securing sensitive plates, papers, color filters, photographic chemicals, and testing the moisture of the air at different altitudes. Special trucks were equipped with photographic laboratories for developing and printing in the field. A considerable proportion of the labor force in this industry was made up of women, and it increased from 303 to 351 in each 1,000 between the first and second drafts.

Optical goods.—The optical goods industry in this country was undeveloped at the beginning of the war. Immediate need of all kinds of instruments with lenses, especially periscopes, sights, and fire-control apparatus, necessitated the full production of the factories doing this work. In addition heavy demands were made on factories whose equipment could be easily transformed to produce this kind of goods. Without optical glass, fire-control instruments could not be made.[16] The manufacture of optical glass requires high precision and accurate control throughout all the factory processes. Glass firms made prismatic compasses; auto light and thermometer establishments helped with quadrant sights, panoramic telescopes and intricate parts to be assembled into various devices. Though this is one of the smaller industries in numbers employed, it afforded women some new and important occupations and opportunities. The proportion of women increased from 327 to 371 in each 1,000 between the first and second drafts, and every plant covered in the survey had women on its force.

Surgical appliances and artificial limbs.—With the beginning of the war, manufacturers of surgical appliances and artificial limbs had to be ready with these supplies for the hospitals. The industry employed a considerable proportion of women which during the war grew from 481 to 551 in every 1,000 wage earners employed.

Instruments, scientific and professional.—The manufacture of scientific and professional instruments was of prime importance to the war. Plants that were already producing limited supplies of instruments were used as laboratories for the making of devices, and as models for expansion of other plants along these lines. Fewer women were employed in this work proportionately than on optical goods or surgical appliances, but it exceeded them both in the proportion of women substituted.

Dental goods.—The manufacture of dental goods was stimulated by the care given to the enlisted and drafted men. There was little variation shown during the war in the proportion of women employed, but even early in the war period women numbered nearly half the force, which would seem to indicate that women were not newcomers in these plants.

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[16] America's Munitions, 1917-18. Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions. Washington, 1919. p. 137-139.

Hats and caps.—Among the minor branches of the war food and fabric industries in which women have always played an important part was the manufacture of hats and caps. These articles are practically a part of clothing and quite as necessary. Factories adjusted their machinery to service hats and overseas caps. A falling off in the labor force of both men and women was nevertheless noticeable, and served to reduce the proportion of women employed from 543 to 533 per 1,000 wage earners.

Furs.—The fur industry also had its contribution to make to the war. In addition to the warm fur clothes which outdoor camp life requires, aviation made special demands for warm fur-lined hats, shoes, gloves, and clothes. Women were less important in this than in other clothing industries, and the war did not seem to advance their position in it materially.

Buttons.—The need of buttons for soldiers' clothing drafted into service factories which had been making electrical goods, phonographic records, and billiard balls. In addition to these the button plants of prewar days were kept busy. In the proportion women formed of the total force there was an increase during the war from 473 to 523 in each 1,000 wage earners, although the actual number of women decreased slightly.

Musical instruments.—The factories whose peace-time product was musical instruments should not be omitted from an enumeration of war industries, for they turned out various war products. Factories which made pianos also did special work on wooden parts for airplanes, and parts of bombs; makers of mechanical players produced aiming devices, projectors, grenades, and small metal parts for airplanes. While not important employers of women they increased their force of women during the war both in actual numbers and in the proportion they formed of the total force.

Toys and sporting goods.—These factories contributed to the war by making small mirrors for periscopes and other similar devices. Skate factories in some instances were called upon to make bombs. Plants in these industries which were covered in this investigation were small ones with relatively small labor forces. Though women were not actually numerous on the force, they formed from 34 to 38 per cent of the total wage earners employed.

Miscellaneous goods.—A group of miscellaneous goods appears in Table 21. Some of the important and various miscellaneous goods needed for war supplies were beds, mattresses, brooms, pens, pipes, roofing materials, and abrasive papers. In many cases plants that manufactured articles listed under this group adapted their product to meet war needs.

TABLE 21.—MEN AND WOMEN EMPLOYED AFTER FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS IN 21 WAR AGENT AND IMPLEMENT OR WAR FOOD AND FABRIC INDUSTRIES.

Industry.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Agricultural implements	116	32,689	30,377	32,201	29,059	488	1,318	15	43	57	29	980	743	10	270	89
Airplanes, seaplanes, and parts	34	12,155	14,469	10,268	11,773	1,887	2,696	169	186	26	18	1,953	799	5	576	452
	[1] 6	.....	12,001	.....	8,589	.....	3,412	.....	284	6	6	3,412	2,412	.....	.....	.....
Automobiles, including bodies and parts	144	32,803	43,053	31,366	38,151	1,437	4,902	44	114	107	51	2,713	1,917	16	728	265
	[1] 19	.....	131,113	.....	121,613	.....	9,500	.....	72	19	11	7,806	6,739	.....	.....	.....
Buttons	44	3,203	2,688	1,688	1,282	1,515	1,406	473	523	33	6	573	46	7	262	21
Carriages, wagons, and materials	36	3,608	3,573	3,530	3,411	78	162	22	45	23	10	131	51	4	12	5
Cars, steam and electric railroad	15	11,438	14,365	11,114	13,529	324	836	28	58	8	8	836	556	.....	.....	.....
Dental goods	14	1,737	1,681	961	932	776	749	447	446	14	5	317	38	4	161	10
Electrical machinery, apparatus, and supplies	172	24,629	25,177	19,352	18,391	5,277	6,786	214	270	155	87	4,751	1,385	31	1,010	349
Fur, tanning, dyeing, and its remanufacture	122	4,075	3,420	2,938	2,372	1,137	1,048	279	306	93	4	100	26	38	638	206
Hats, caps, and their materials	323	20,703	15,394	9,454	7,186	11,249	8,208	543	533	312	27	1,694	104	61	1,399	328
Instruments, scientific and professional	46	5,306	5,224	4,538	4,332	768	892	145	171	38	19	699	278	7	94	22
Motion picture and photographic apparatus and supplies	32	9,319	9,519	6,492	6,180	2,827	3,339	303	351	30	13	3,129	346	7	72	18
Motor cycles, bicycles, and parts	7	2,532	2,927	2,364	2,640	168	287	66	98	6	4	283	225	.....	.....	.....
Musical instruments	77	11,159	13,703	11,818	10,146	2,341	3,557	165	260	64	41	3,386	1,048	8	113	44
Optical goods	21	1,412	1,365	950	858	462	507	327	371	21	11	355	103	8	144	47
Railroad repair shops	10	4,323	4,197	4,186	4,015	137	182	32	43	6	3	89	37	1	3	3
Rubber goods	80	23,987	21,952	17,354	14,180	6,633	7,772	276	354	73	33	6,518	994	17	614	134
	[1] 3	.....	21,294	.....	17,378	.....	3,916	.....	184	3	1	375	375	.....	.....	.....
Shipbuilding, including boat building	72	42,563	60,058	42,317	59,646	246	412	6	7	25	7	174	101	11	208	93
	[1] 5	.....	36,186	.....	35,552	.....	634	.....	18	5	5	634	453	.....	.....	.....
Surgical appliances and artificial limbs	30	2,717	3,117	1,411	1,401	1,306	1,716	481	551	29	7	374	110	10	1,203	460
Toys and sporting goods	53	2,298	2,186	1,486	1,359	812	827	339	378	50	18	344	112	15	320	127
Miscellaneous goods[2]	379	21,553	19,234	14,243	12,468	7,310	6,766	339	352	340	102	3,573	637	51	951	292
Total for plants reporting after both first and second drafts	1,827	277,209	297,679	230,031	243,311	47,178	54,368	170	183	1,510	503	32,972	9,656	311	8,778	2,965
Total for all plants, including 33 reporting after second draft only	1,860	.....	498,273	.....	426,443	.....	71,830	170	144	1,543	526	45,199	19,635	.....	.....	.....

[1] When figures are bracketed the lower one represents firms reporting after the second draft only.
[2] Includes beds, mattresses, brooms, pens, pipes, roofing materials, and abrasive papers.

CHANGES IN THE LABOR FORCE BY STATES.

For the sake of those interested in the variations in different parts of the country in the changes in the labor force, tables showing similar facts to those presented in the preceding tables are given here for three of the leading industries by States. It was not possible to summarize this information about localities for all war agent and implement and war food and fabric industries combined, since the data by States were incomplete for some important industries or reported in such a way by large corporations as to make correct distribution by States impossible. The information, therefore, is presented only for the iron and steel industry, the metal trades, and the manufacture of lumber products. Striking variations in the proportion of women in the same industry between States are doubtless due quite as much to the local concentration of differing branches of the industry as to differing attitudes of employers in certain States toward the employment of woman workers.

TABLE 22.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE IRON AND STEEL INDUSTRY, BY STATES.

State.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Alabama	5	1,690	1,526	1,690	1,515	.....	11	.....	7	1	1	11	11	.....	.....	.....
Arizona	2	52	46	52	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Arkansas	2	84	72	83	66	1	6	12	83	2	1	5	5	.....	.....	.....
California	69	2,756	2,747	2,702	2,676	54	71	20	26	28	4	23	13	6	23	6
Colorado	18	1,259	1,158	1,222	1,084	37	74	29	64	5	2	43	43	.....	.....	.....
Connecticut	175	66,776	76,842	55,884	61,435	10,892	15,407	163	201	129	52	13,125	3,103	25	905	497
	1 1	.....	10,718	.....	6,185	.....	4,533	.....	453	1	1	4,533	611	.....	.....	.....
Delaware	13	2,139	2,486	2,068	2,172	71	314	33	126	6	2	47	15	1	250	250
District of Columbia	2	2,520	2,021	2,519	2,020	1	1	(2)	(2)	1	.....	.....	.....	.....	.....	.....
Georgia	16	2,520	2,251	2,501	2,171	19	80	8	36	4	3	79	59	.....	.....	.....
Illinois	333	63,803	67,175	61,421	62,594	2,382	4,581	37	68	170	83	3,903	2,185	28	386	215
	1 3	.....	17,925	.....	16,021	.....	1,904	.....	106	3	1	24	24	.....	.....	.....
Indiana	32	3,993	6,756	3,852	6,329	141	427	35	63	14	3	159	75	5	240	201
Iowa	45	3,532	3,656	3,439	3,418	93	238	26	65	28	15	191	142	4	27	16
Kansas	25	2,287	2,132	2,275	2,114	12	18	5	8	8	1	3	1	3	5	5
Kentucky	17	3,357	3,134	3,324	3,079	33	55	10	18	7	3	45	16	.....	.....	.....
Maine	11	3,544	3,442	3,475	3,363	69	79	19	23	7	2	21	9	1	20	9
Maryland	6	574	1,116	573	843	1	273	2	245	4	2	57	57	1	215	215
	1 2	.....	20,100	.....	24,000	.....	5,100	.....	175	2	2	5,100	5,079	.....	.....	.....
Massachusetts	84	10,788	12,468	9,281	10,067	1,507	2,401	140	193	38	10	164	130	14	2,205	764
	1 2	.....	10,017	.....	9,165	.....	852	.....	85	2	.....	.....	.....	.....	.....	.....
Michigan	131	19,742	22,156	18,877	20,103	865	2,053	44	93	87	43	874	511	20	926	725
	1 1	.....	792	.....	617	.....	175	.....	221	1	1	175	175	.....	.....	.....
Minnesota	5	100	87	85	68	15	19	150	218	4	2	11	4	.....	.....	.....
Mississippi	3	78	94	77	91	1	3	13	32	2	1	1	1	1	2	1
Missouri	42	3,739	3,844	3,706	3,691	33	153	9	40	12	3	42	23	1	97	97
Nebraska	4	383	373	373	350	10	23	26	62	4	2	19	13	.....	.....	.....
New Jersey	1	25	294	25	288	.....	6	.....	20	1	.....	.....	.....	1	6	6
North Carolina	9	324	273	322	271	2	2	6	7	2	.....	.....	.....	.....	.....	.....
North Dakota																

North Dakota	2	55	58	32	35	23	23	418	397	2				1	22	1
New York	[156	63,203	60,425	60,825	63,962	2,378	5,463	38	77	436	60	1,551	2,494	26	711	342
	[2		11,308		10,279		1,929		91	2	1	800	80			
Ohio	20	2,654	3,024	2,607	2,895	47	129	18	43	11	6	70	43	2	49	32
Oklahoma	17	785	767	781	764	4	3	5	4	3	1	1	1			
Oregon	22	2,625	4,367	2,578	4,226	47	141	18	32	11	2	4	4	5	132	90
Pennsylvania	[170	67,071	69,643	64,778	65,932	2,293	3,711	34	53	91	34	2,798	1,790	29	385	147
	[[1] 5		42,617		36,104		6,513		153	5	3	1,088	733			
Rhode Island	53	16,247	16,474	14,481	13,975	1,766	2,490	109	152	31	9	2,176	699	10	214	18
South Carolina	1	38	31	38	27		4		129	1	1	4	4			
Tennessee	38	4,766	5,033	4,653	4,808	113	225	24	45	15	8	172	99	3	41	40
Texas	8	719	553	711	544	8	9	11	16	2				1	2	1
Utah	6	306	353	304	349	2	4	7	11	3	1	2	1	1	1	1
Vermont	3	227	229	223	221	4	8	18	35	3	1	2	1	2	6	3
Washington	46	1,488	1,901	1,460	1,856	28	45	19	24	16	4	24	10	7	13	8
West Virginia	30	7,112	7,241	6,922	6,997	190	244	27	34	14	7	212	117	3	8	5
Wisconsin	202	30,895	34,129	30,089	32,344	806	1,785	26	52	92	43	1,431	790	13	270	182
Total for plants reporting after both first and second drafts	2,124	394,256	429,377	370,308	388,789	23,948	40,588	61	95	995	421	30,170	12,469	214	7,161	3,977
Total for all plants, including 16 reporting after second draft only	2,140	.....	551,854	.....	491,160	.....	60,694	.....	110	1,011	430	41,800	19,171	.....	.....	.....

[1] When figures are bracketed, the lower one represents firms reporting after the second draft only.

[2] Less than one in every 1,000 wage earners.

TABLE 23.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE OF METAL AND METAL PRODUCTS OTHER THAN IRON AND STEEL, BY STATES.

State.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Arizona	4	3,838	3,458	3,822	3,432	16	26	4	8	3	2	23	12			
California	52	2,903	2,184	2,221	1,660	772	524	258	240	28	11	255	47	2	40	17
Colorado	13	2,795	2,147	2,785	2,084	10	63	4	29	9	3	4	4	5	54	51
Connecticut	51	29,796	29,747	23,191	22,173	6,605	7,574	222	255	46	21	6,450	870	4	47	7
Delaware	2	367	300	354	267	13	33	35	110	1	1	33	22			
Georgia	6	386	379	379	372	7	7	18	18	3				1	3	1
Illinois	145	15,137	14,792	11,303	10,498	3,834	4,294	253	290	72	21	3,665	415	13	524	106
Indiana	4	84	141	82	116	2	25	24	177	2	1	21	21	1	4	2
Iowa	5	151	143	133	130	18	13	119	91	2						
Kentucky	4	1,224	1,541	1,173	1,463	51	78	42	51	3	1	10	6	1	67	29
Maine	1	24	15	23	14	1	1	42	67	1						
Maryland	3	3,284	3,410	3,103	3,154	181	256	55	75	3	3	256	78			
Massachusetts	25	1,892	1,928	1,764	1,644	128	284	68	147	14	8	266	75			
Michigan	28	2,716	3,480	2,427	2,856	289	624	106	179	19	11	574	182	3	38	20
Missouri	17	1,665	1,611	1,546	1,479	119	132	71	82	8	2	67	11	2	57	3
Montana	1	3,516	3,373	3,498	3,341	18	32	5	9	1	1	32	14			
New Hampshire	3	268	281	127	110	141	171	526	609	3	1	8	7	2	163	23
New York	298	26,707	26,942	22,987	22,703	3,720	4,239	139	157	163	41	1,460	544	35	1,525	425
Ohio	8	364	391	344	347	20	44	55	113	3	1	27	27			
Oklahoma	2	760	730	760	730											
Oregon	3	62	118	60	107	2	11	32	93	3	2	9	9			
Pennsylvania	31	9,077	8,877	8,277	7,921	800	956	88	108	25	16	620	467	3	139	28
Rhode Island	111	6,779	4,761	4,770	2,741	2,009	2,020	296	424	100	36	1,307	258	18	346	86
Tennessee	4	1,737	2,148	1,715	2,019	22	129	13	60	2	1	124	102	1	5	5
Utah	3	4,165	3,772	4,164	3,771	1	1	(1)	(1)	1						
Vermont	1	63	47	60	45	3	2	48	43	1						
Washington	11	698	553	666	513	32	40	46	72	5	1	36	6	1	1	1
West Virginia	12	2,289	1,981	2,002	1,683	287	298	125	150	6	3	294	37			
Wisconsin	45	10,007	10,518	9,325	9,245	682	1,273	68	121	31	16	954	538	7	209	25
Total	896	132,844	129,768	113,061	106,618	19,783	23,150	149	178	558	204	16,495	3,752	99	3,222	829

(1) Less than 1 in every 1,000 wage earners.

TABLE 24.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE AND REMANUFACTURE OF LUMBER, BY STATES.

State.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
Alabama	8	339	320	337	317	2	3	6	9	1	.....	.....	.....	1	3	1
Arizona	4	1,215	1,075	1,214	1,074	1	1	(1)	(1)	1	.....	.....	.....	.....	.....	.....
Arkansas	86	10,380	10,000	10,148	9,313	232	687	22	69	53	44	649	493	4	20	20
California	37	3,605	3,280	3,427	3,035	178	245	49	75	26	11	157	96	3	33	27
Colorado	4	342	347	308	302	34	45	99	130	3	.....	.....	.....	1	42	11
Connecticut	24	1,051	944	918	828	133	116	127	123	21	2	36	11	.....	.....	.....
Delaware	4	137	123	127	111	10	12	73	98	3	1	4	2	1	5	1
Florida	5	1,795	1,196	1,774	1,122	21	74	17	62	2	2	74	53	.....	.....	.....
Georgia	25	2,127	2,007	2,040	1,768	87	239	41	119	13	10	224	137	2	12	12
Idaho	2	1,937	866	1,862	804	75	62	39	72	2	1	12	12	.....	.....	.....
Illinois	90	7,528	7,165	7,028	6,334	500	831	66	116	63	34	678	370	7	55	26
Indiana	26	1,879	1,953	1,702	1,610	177	343	94	176	21	10	264	180	2	3	3
Iowa	18	2,201	2,184	2,204	1,855	87	329	38	151	11	6	314	104	.....	.....	.....
Kansas	17	851	957	834	868	17	89	20	93	12	7	75	62	1	7	1
Kentucky	20	2,662	2,495	2,584	2,114	78	381	29	153	14	8	364	309	2	2	2
Louisiana	14	2,778	2,626	2,771	2,601	7	25	3	10	11	4	14	13	2	5	5
Maine	30	1,869	1,886	1,734	1,603	135	283	72	150	23	9	128	84	3	121	111
Maryland	1	80	59	80	45	.....	14	.....	237	1	1	14	14	.....	.....	.....
Massachusetts	15	1,241	1,160	1,078	947	163	213	131	184	12	3	70	32	3	129	39
Michigan	44	6,954	7,340	6,443	6,097	511	1,243	73	169	36	32	1,131	389	2	96	94
Minnesota	1	39	43	37	40	2	3	51	70	1	1	3	1	.....	.....	.....
Mississippi	36	5,296	4,739	5,190	4,594	106	145	20	31	12	6	54	49	2	19	17
Missouri	61	5,635	5,848	5,327	5,336	308	512	55	88	36	20	327	196	6	82	26
Montana	13	1,847	1,998	1,841	1,979	6	19	3	10	6	5	18	13	.....	.....	.....
New Hampshire	26	1,719	1,555	1,679	1,472	40	83	23	53	17	7	64	51	1	5	1
New Mexico	4	1,066	941	1,039	913	27	28	25	30	3	1	6	4	.....	.....	.....

(1) Less than one in every 1,000 wage earners.

TABLE 24.—MEN AND WOMEN EMPLOYED AFTER THE FIRST AND SECOND DRAFTS AND WOMEN SUBSTITUTED ON MEN'S WORK OR ADDED WITHOUT SUBSTITUTION AFTER THE SECOND DRAFT IN PLANTS ENGAGED IN THE MANUFACTURE AND REMANUFACTURE OF LUMBER, BY STATES—Continued.

State.	Total firms reporting.	Labor force.								Total firms employing women after second draft.	Substitution of women on men's work after second draft.			Increase in force of women without substitution after second draft.		
		Total.		Men.		Women.										
						Actual number.		Number per 1,000 wage earners.								
		After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.	After first draft.	After second draft.		Firms substituting women.	Women employed.	Women substituted.	Firms adding women.	Women employed.	Women added.
New York	200	17,155	14,745	15,627	12,918	1,528	1,827	89	124	106	51	842	428	17	108	57
North Carolina	32	2,788	2,326	2,638	2,129	150	197	54	85	12	4	167	157	3	11	4
Ohio	8	228	249	200	206	28	43	123	173	3	1	28	1	1	13	2
Oklahoma	3	2,600	1,600	2,588	1,579	12	21	5	13	3	2	16	12	.....	.....	.....
Oregon	70	9,893	10,254	9,669	9,723	224	531	23	52	47	22	344	260	12	111	65
Pennsylvania	49	5,009	4,515	4,398	3,602	611	913	122	202	38	23	495	408	1	1	1
Rhode Island	8	323	291	319	286	4	5	12	17	4	.....	.....	.....	1	2	1
South Carolina	15	4,449	3,160	4,391	3,110	58	50	13	16	7	4	38	30	2	4	2
Tennessee	72	7,724	7,486	7,286	6,321	438	1,165	57	156	49	37	1,074	754	4	75	44
Texas	15	4,827	4,264	4,811	4,206	16	58	3	14	7	4	47	39	1	7	4
Utah	4	233	234	219	217	14	17	60	73	3	2	16	3	.....	.....	.....
Vermont	2	73	78	73	70	.....	8	.....	103	1	1	8	7	.....	.....	.....
Washington	100	9,646	9,406	9,407	8,892	239	514	25	55	52	32	322	182	6	148	111
West Virginia	19	1,867	2,747	1,831	2,528	36	219	19	80	13	9	206	174	2	10	9
Wisconsin	140	21,018	17,816	20,129	16,084	889	1,732	42	97	97	53	1,373	936	14	129	64
Total	1,352	154,496	142,278	147,312	128,953	7,184	13,325	51	94	846	470	9,658	6,066	107	1,258	761

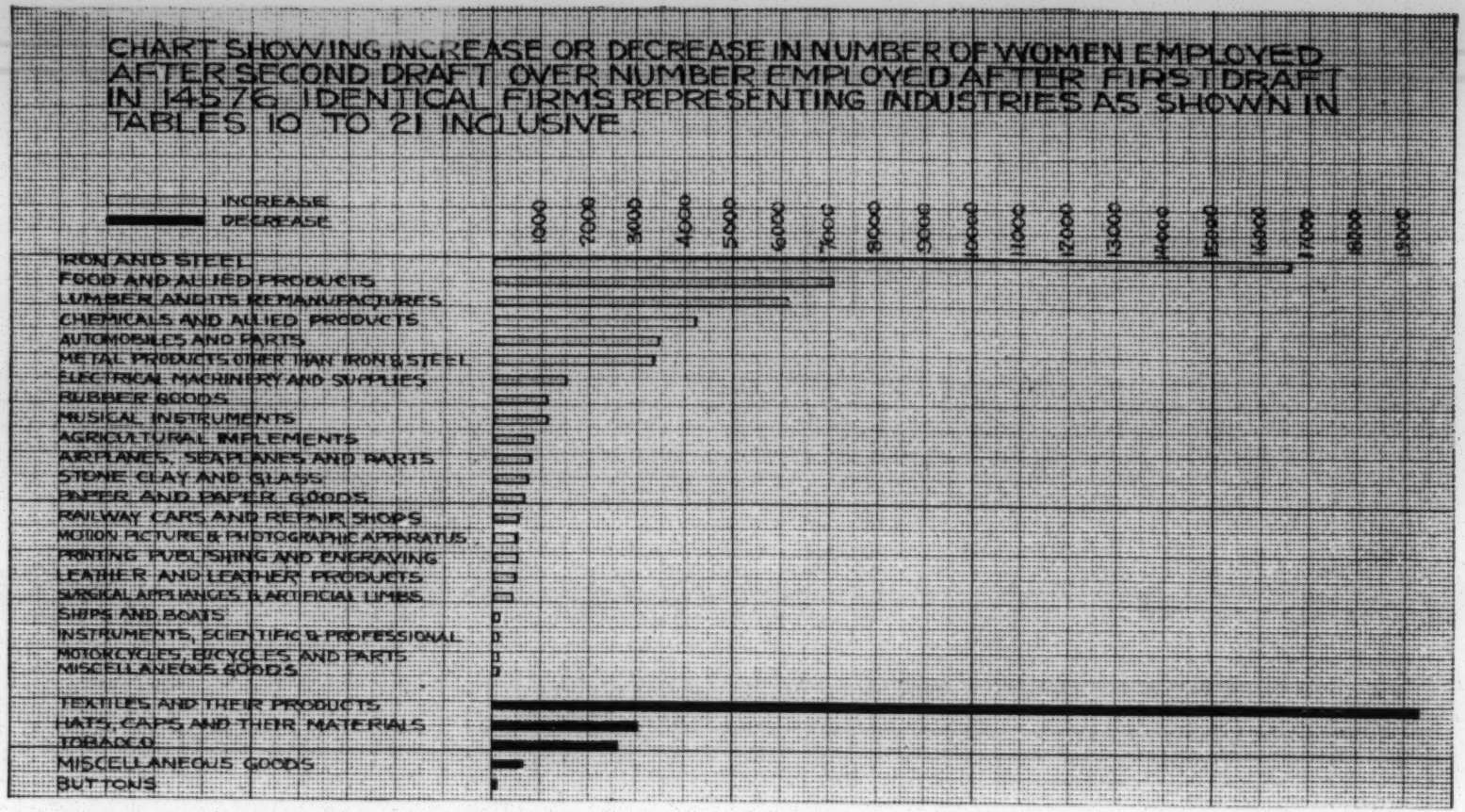
COMPARATIVE PROPORTION OF WOMEN IN WAR AGENT AND IMPLEMENT INDUSTRIES BEFORE, DURING, AND AFTER THE WAR.

All of the foregoing tables, except Table 2, deal with changes in the labor force during the war period. Table 25 throws light on the proportion of women on the labor force in leading war agent and implement industries during the war, as compared with the proportion shown by the Census of Manufactures for 1914, the proportion in the same industries during 1916, and the proportion nine months after the signing of the armistice. While only about a third of the firms reporting for 1916 and during our participation in the war are identical, the numbers are so large in both cases as to make the figures a distinctly valuable index of the change effected by the war. The firms reporting after the war are all included among those reporting during the war. A summary of this table has already been shown in Section I of this report as Table 1.

TABLE 25.—PROPORTION OF WOMEN ON LABOR FORCE IN LEADING WAR AGENT AND IMPLEMENT INDUSTRIES BEFORE, DURING, AND AFTER THE WAR.

Industry.	Before the war—1914.[1]			Before entrance of United States into war—1916.[2]			During participation of United States in war—1918.[3]						After signing of armistice—1919.[4]		
							After first draft.			After second draft.					
	Firms reporting.	Total wage earners.	Women per 1,000 wage earners.	Firms reporting.	Total wage earners.	Women per 1,000 wage earners.	Firms reporting.	Total wage earners.	Women per 1,000 wage earners.	Firms reporting.	Total wage earners.	Women per 1,000 wage earners.	Firms reporting.	Total wage earners.	Women per 1,000 wage earners.
Iron and steel and their products	17,862	1,053,977	29	3,096	1,127,568	33	2,124	394,256	61	2,124	429,377	95	380	175,137	94
Lumber and its remanufactures	42,016	941,100	21	1,466	271,917	40	1,352	154,496	46	1,352	142,278	94	204	39,954	68
Cars, steam and electric railroad, and railroad repair shops	2,128	423,061	2	357	199,052	2	25	15,761	29	25	18,562	55	5	6,060	16
Stone, clay, and glass products	15,112	381,296	39	453	107,965	59	322	38,680	115	322	33,469	155	47	9,131	154
Leather and its finished products	6,758	312,224	277	784	231,777	304	810	114,107	307	810	107,634	330	72	32,909	263
Chemicals and allied products	11,021	282,236	85	674	255,213	79	733	91,882	98	733	93,025	142	186	35,071	85
Metal and metal products other than iron and steel	9,919	257,862	150	803	258,749	148	896	132,844	149	896	129,768	178	223	67,872	191
Automobiles, including bodies and parts	1,271	129,038	18	358	245,705	21	144	32,803	44	144	43,053	114	80	142,950	43
Electrical machinery, apparatus, and supplies	1,030	111,251	202	219	126,620	175	172	24,629	214	172	25,177	270	20	20,538	173
Rubber goods	342	74,788	205	140	104,687	187	80	23,987	277	80	21,952	354	10	44,992	116
Carriages, wagons, and materials	5,057	51,223	15	65	10,462	15	36	3,608	22	36	3,573	45	6	2,374	2
Agricultural implements	601	49,608	10	89	46,248	18	116	32,689	15	116	30,377	43	13	19,494	37
Musical instruments	737	48,696	77	118	35,324	81	77	14,159	165	77	13,703	260	9	9,195	246
Shipbuilding, including boat building	1,147	42,735	2	68	45,071	1	72	42,563	6	72	60,058	7	15	52,651	2
Optical goods	314	8,102	265	9	3,426	154	21	1,412	327	21	1,365	371	5	6,393	251
Motion picture and photographic apparatus and supplies	146	7,796	278	26	9,883	277	32	9,319	303	32	9,519	351	3	6,885	347
Instruments, scientific and professional	307	7,297	156	47	7,232	152	46	5,306	145	46	5,224	171	25	6,599	135
Motor cycles, bicycles, and parts	78	6,706	20	9	5,528	77	7	2,532	66	7	2,927	98	4	2,595	91
Airplanes, seaplanes, and parts	16	211	5	12	2,100	36	34	12,155	155	34	14,469	186	17	8,642	88
Total	115,862	4,189,207	65	8,703	3,094,527	77	7,099	1,147,188	106	7,099	1,185,510	139	1,324	689,442	100

[1] Figures compiled from United States Bureau of Census, Abstract of Census of Manufactures, 1914, pp. 516–543, are for Dec. 15, 1914, or nearest representative day.
[2] Figures made accessible by the War Industries Board and the National League for Woman's Service are for the summer of 1916.
[3] Figures made accessible by the War Industries Board and the Department of Labor are for February–March, 1918, seven to eight months after the first draft, and for October–November, 1918, four to five months after the first drawing for second draft.
[4] Figures secured directly by field agents engaged in this survey are for August, 1919, nine months after the signing of the armistice.



Railway cars and repair shops combines cars, steam and electric railroad, and railroad repair shops as shown in Table 21.
Under increase, miscellaneous includes carriages, wagons and materials, optical goods, and toys and sporting goods.
Under decrease, miscellaneous includes tanning, dyeing and remanufacturing of furs, dental goods, beds, mattresses, brooms, pens, pipes, roofing materials, and abrasive papers.

As revealed in Table 25, the tendency in women's employment in industries offering them new occupations was toward a consistent increase in number and proportion from 1914 through the peak period of production for the war in October and November, 1918, with a slight dropping off in the period after the signing of the armistice. This tendency for these industries as a whole was true in varying degrees of the individual industries. In some cases the increase in the importance of women on the force was very slight in the period between 1914 and 1916, but took a large leap by February, 1918, some seven months after the first draft, with an even greater one after the second draft. Instances of this kind were found in the iron and steel, automobile, musical instrument, and car manufacturing industries. In some other trades the proportion of women decreased between 1914 and 1916, but rose markedly during the war period. Examples of this tendency were found in the chemical, electrical machinery, rubber goods and optical goods industries. In a few industries a decrease was found between the 1916 status and that after the first draft, but without exception the period after the second draft showed a marked increase over that after the first draft. With only one exception—and that an important one, namely, metal trades—the proportion of women in the war agent and implement industries included, suffered a falling off in the postarmistice period. In the metal trades the proportion of women rose from 178 in each 1,000 employed after the second draft to 191 in each 1,000 nine months after the armistice. The falling off in the iron and steel industry, the manufacture of stone, clay, and glass products, and of motion-picture apparatus and supplies, however, was negligible. That practically the same industries remained the chief employers of women after the armistice as before is evidenced by a listing of the six industries which had the largest proportion of women after the second draft and after the armistice. For the first-mentioned period the six industries in order of their importance were the manufacture of optical goods, rubber goods, motion-picture and photographic apparatus and supplies, leather goods, electrical machinery, and musical instruments. For the postarmistice period they were the manufacture of motion-picture and photographic apparatus and supplies, leather goods, optical goods, musical instruments, metal products other than iron and steel, and electrical machinery. Except for the substitution of metal products for rubber goods, the group is the same in a slightly altered order. A falling off in proportion of women was found in the automobile and chemical industries. The rubber industry, in which women had made marked progress during the war, also suffered a decided setback with the signing of the armistice. This fact is due, however, to the shutting down of the gas-mask factories included in this group. In other branches of this industry women have more than held their own.

The foregoing table is visualized so far as the principal industries are concerned by the chart on the opposite page.

The increasing importance of women in the labor force of war industries is also shown in Table 26, but this table is based only on data from identical firms reporting for the 1916 period, for the periods after the first and after the second drafts, and for August, 1919. The reports from these firms serve to measure the validity of the figures shown in Table 25, which is based on a much larger but not identical number of firms.

The large reductions in forces of both men and women after the armistice must not be taken as indicating shutdowns in plants, or even as reductions of the regular working forces. In many cases the losses are due to the elimination of second and third shifts, and in the case of women the drafting out of part-time and night workers. In fact, the reports from employers to agents of this survey indicate that large reduction in the number of woman workers was due to the voluntary withdrawal of the married woman war workers, and the part-time leisure workers. The revival of the luxury and other peace-time industries drew, to some extent, both the men and women released by the plants making exclusive war-time products. It will be noticed, however, that all these causes combined have not reduced the numbers of women to the proportion prevailing before the war. Although the proportions of women employed vary somewhat from those shown in Table 25, the tendency observed there in the trend of woman's labor is corroborated by these figures for identical plants, namely, a steady increase from 1916 through the war with a dropping off after the armistice.

TABLE 26.—NUMBER AND PROPORTION OF MEN AND WOMEN WAGE EARNERS EMPLOYED BEFORE, DURING, AND AFTER THE WAR IN 474 IDENTICAL FIRMS IN LEADING WAR AGENT AND IMPLEMENT INDUSTRIES.

Industry.	Firms.	Wage earners.															
		Men.								Women.							
		Actual number.				Number per 1,000 employed.				Actual number.				Number per 1,000 employed.			
		1916	After first draft.	After second draft.	1919	1916	After first draft.	After second draft.	1919	1916	After first draft.	After second draft.	1919	1916	After first draft.	After second draft.	1919
Iron and steel and their products	162	87,815	85,863	90,331	70,710	935	892	843	893	6,062	10,403	16,819	8,467	65	108	157	107
Metal and metal products other than iron and steel	62	49,164	45,052	44,807	36,713	848	823	794	820	8,795	9,023	11,605	8,065	152	167	206	180
Lumber and its remanufactures	130	26,321	23,114	21,046	25,418	969	955	886	929	850	1,088	2,701	1,933	31	45	114	71
Leather and its finished products	18	15,493	14,530	13,357	16,914	748	714	684	708	5,227	5,807	6,179	6,964	252	286	316	292
Chemicals and allied products	33	15,526	24,952	24,122	23,159	965	931	870	936	562	1,856	3,628	1,582	35	69	131	64
Automobiles, including bodies and parts	15	6,336	7,163	13,254	9,203	953	941	825	869	311	451	2,814	1,390	47	59	175	131
Electrical machinery, apparatus, and supplies	14	4,549	4,605	4,474	5,312	886	938	767	844	585	307	1,359	985	114	62	233	156
Instruments, scientific and professional	10	904	1,012	1,056	1,103	926	781	763	824	72	283	328	236	74	219	237	176
Other industries [1]	30	15,213	19,903	19,881	21,828	856	818	763	803	2,564	4,443	6,164	5,370	144	182	257	197
Total	474	221,321	226,194	232,328	210,360	898	870	818	857	25,028	33,661	51,597	34,992	102	130	182	143

[1] Includes plants in following industries: 5, airplanes, seaplanes, and parts; 2, bicycles, motor cycles, and parts; 1, surgical appliances and artificial limbs; 3, motion pictures and photographic apparatus and supplies; 3, cars, steam and electric railroad; 1, optical goods; 4, musical instruments; 7, rubber goods; 4, stone, clay, and glass.

RELATIVE RETENTION OF MEN AND WOMEN AFTER SIGNING OF ARMISTICE.

Further light is thrown upon the proportion of men and women retained after the signing of the armistice by Table 27. It is based on the reports of over 1,000 identical firms furnishing figures on the number of men and women employed in November, 1918, and August, 1919. This table shows that nine months after the signing of the armistice the 1,012 firms had retained a little more than 60 per cent of the male labor employed before the signing of the armistice, and nearly 45 per cent of the woman labor. The largest reductions both in the man and woman labor forces occurred in the iron and steel industry and in the manufacture of chemicals and allied products. In both of these industries the large plants were engaged on exclusively war-time orders—munitions and explosives. In these plants, too, were the large majority of part-time woman workers—married women and leisure women—who dropped out of the ranks of the wage earners at the signing of the armistice. As before stated, these part-time workers account in large measure, according to the statement of employers, for the difference in the relative number of men and women remaining after the signing of the armistice. In this connection the proportion of firms retaining their women substitutes, as shown in the critical analysis of the results of substitution, is illuminating.[1]

TABLE 27.—MEN AND WOMEN EMPLOYED IN 1,012 FIRMS IN FOUR LEADING WAR AGENT AND IMPLEMENT INDUSTRIES AT THE TIME OF THE ARMISTICE AND NINE MONTHS LATER.

Industry.	Firms.	Wage earners employed in—					
		November, 1918.		August, 1919.			
				Men.		Women.	
		Men.	Women.	Number.	Per cent of pre-armistice force.	Number.	Per cent of pre-armistice force.
Iron and steel and their products.	365	244,853	40,916	142,212	58.1	14,123	34.5
Metal and metal products other than iron and steel.....	202	62,132	16,177	52,891	85.1	12,622	78.0
Lumber and its remanufactures	259	32,185	3,227	36,619	113.7	2,671	82.8
Chemicals and allied products..	186	89,881	14,553	32,104	35.7	2,967	20.4
Total.....	1,012	429,051	74,873	263,826	61.5	32,383	43.3

DEMAND FOR AND SUPPLY OF MAN AND WOMAN LABOR BEFORE AND AFTER SIGNING OF ARMISTICE.

The best available index of the course of the supply and demand for labor is to be found in the demands made on the offices of public employment bureaus by employers and workers. But even such data as can be found in their records must be considered in the light of certain qualifications. For example, the official order issued in August, 1918, requiring employers to engage all common labor through the offices of the United States Employment Service was

[1] See Table 32, p. 117.

null and void with the signing of the armistice, and this circumstance may have had as potent an influence in decreasing the number of calls for labor in the subsequent months as the readjustment of industrial conditions. Furthermore, because of the speed with which this service was developed and the novelty of its use to American employers and workers, all industries and all places were not proportionately represented in its transactions. Nevertheless Table 28, which is based on records of the United States Employment Service, indicates in some measure the effect of the signing of the armistice on the calls for man and woman labor in industries which have been regarded as the special sphere of woman's industrial activities. It is especially noticeable that both the demand for and supply of labor for domestic and personal service increased after the armistice. While there was a greater percentage of increase in the case of men than in the case of women, the actual number of men involved is insignificant in comparison with the number of women. The prevalent assumption that some of the old employments of women reabsorbed at least a part of the woman labor released from war plants that shut down altogether at the signing of the armistice receives a degree of support from these figures on domestic service. In the textile industry, while a greater drop proportionately occurred in the demand for than in the supply of woman workers, the actual number of women called for by employers was still more than double the number of women applying for jobs. The situation among men workers in this industry was quite different. The number of men applying for work increased after the signing of the armistice nearly 18 per cent, while the number of calls for men workers decreased 60 per cent, leaving an actual surplus of workers over the demands for their services. In the manufacture of food products and in the tobacco industry the conditions of demand and supply of woman labor were quite similar to those in the textile industry, namely, a decrease in both calls and applicants, yet an actual preponderance of the former over the latter.

TABLE 28.—CALLS FOR LABOR AND APPLICATIONS FOR WORK IN FOUR LEADING OCCUPATIONS AND IN ALL OCCUPATIONS FOR MEN AND WOMEN, AS SHOWN IN THE RECORDS OF THE UNITED STATES EMPLOYMENT SERVICE FOR FOUR WEEKS PREVIOUS TO SIGNING OF ARMISTICE AND FOR FOUR WEEKS, THREE MONTHS AFTER SIGNING OF ARMISTICE.[1]

Occupation.	Workers wanted.					
	Men.			Women.		
	Before armistice.	After armistice.		Before armistice.	After armistice.	
		Number.	Per cent increase (+) or decrease (−).		Number.	Per cent increase (+) or decrease (−).
Manufacture of food and food products	3,179	1,139	− 64.2	1,272	932	−26.7
Manufacture of tobacco products	10	365	+3,550.0	843	615	−27.0
Manufacture of clothing and textiles	7,262	2,903	− 60.0	20,798	6,124	−70.6
Domestic service	130	503	+ 286.9	14,007	17,791	+27.0
All occupations	1,359,060	364,030	− 73.2	206,848	100,450	−51.4

Occupation.	Applicants for work.					
	Men.			Women.		
	Before armistice.	After armistice.		Before armistice.	After armistice.	
		Number.	Per cent increase (+) or decrease (−).		Number.	Per cent increase (+) or decrease (−).
Manufacture of food and food products	926	1,255	+ 35.5	691	389	−43.7
Manufacture of tobacco products	31	90	+190.3	553	222	−59.9
Manufacture of clothing and textiles	2,597	3,059	+ 17.8	4,950	3,055	−38.3
Domestic service	146	375	+156.8	5,579	9,614	+72.3
All occupations	518,485	410,669	− 20.8	91,288	72,659	−20.4

[1] These data include the leading industrial States. The weeks indicated are Oct. 19–Nov. 9, 1918, and Feb. 15–Mar. 8, 1919.

SECTION III.

RESULTS OF SUBSTITUTION OF WOMEN ON MEN'S WORK DURING AND SINCE THE WAR.

PRINCIPLES OF MANUFACTURE.

Throughout the war-industries in which women were substituted for men many occupations are fundamentally similar. Various materials were worked into finished products by various methods, but, if the basic material were metal, whether the finished product was a gun or an instrument; if the basic material were wood, whether the finished product was an airplane strut or a desk; if the basic materials were chemicals, whether the finished products were explosives or baking powders, the same underlying principles guided the composition or dressing or shaping of each basic material into the finished product. The machines and machinery operated, the laboring work involved, the testing, inspecting, sorting, assembling, and packing required widely differing degrees of skill and experience; the work was light or heavy, according to the weight of the several parts made; great or little exactness in workmanship was required, according to the varying purposes for which the product was to be used. But the majority of machines used to work metals, or lumber, or chemicals, or other materials were built and operated in a like manner, and the same kinds of hand work had to be done in each industry. To avoid duplication in description, therefore, analysis of the occupations in which women replaced men is treated according to the materials worked upon instead of by industry. Whether a hole is drilled in a piece of metal in an airplane factory or in a cigar machinery plant, the work is grouped under "drilling-machine operators in metal-working occupations." Presses operated to cut out tin-can blanks in a chemical factory are grouped with presses operated in factories making metal goods only. Only such occupations as involved working on two or more materials or those peculiar to an individual industry have been grouped separately on the tables. A list of the new work done by women in each industry is given, however, at the close of this section in order that the specific tasks accomplished by women in each industry may be recorded.

Of the 562 firms reporting on the occupations in which men were replaced by women, almost half employed women on metal work. As shown in Table 29 which follows, 37,683 substitutes, or a little less than two-thirds of the total number reported, were employed on this material. The next largest substitution was reported on chemical work, although the number of firms reporting was much lower than for wood-working occupations. The 152 wood-working firms reported a substitution of but 2,545 women, whereas 58 chemical plants substituted 6,935 women. Eleven establishments manu-

facturing rubber into finished products used 4,959 women in men's places. New leather working occupations were filled by 1,545 women, while a slightly larger number were engaged on textile work in men's places and in airplane and shipbuilding plants. The substitution in the 22 electrical and 14 stone and glass working establishments reporting was in each case less than 1,000.

In addition to indicating the extent of the substitution of women on men's work during the war by occupational groups in the establishments covered, Table 29 shows the success or failure of such substitution as reported by employers.

TABLE 29.—EXTENT AND SUCCESS OF SUBSTITUTION OF WOMEN FOR MEN DURING AND AFTER THE WAR EITHER THROUGH DIRECT REPLACEMENT OR THROUGH EXPANSION IN 562 MANUFACTURING ESTABLISHMENTS, BY OCCUPATIONAL GROUPS.

Occupational group.	Firms.		Total women substituted.[1]	Firms reporting women's work.				
	Substituting women.	Reporting number of women substituted.		As satisfactory or better than men's.		Not as satisfactory as men's.		Not comparable.
				Number.	Per cent.	Number.	Per cent.	
Metal working	278	267	37,683	212	82.8	44	17.2	22
Chemical working	58	50	6,935	32	66.7	16	33.3	10
Rubber working	11	10	4,959	9	100.0	.....	.....	2
Wood working	152	145	2,545	91	68.4	42	31.6	19
Textile making	16	13	1,589	12	80.0	3	20.0	1
Leather working	20	18	1,545	17	85.0	3	15.0	.....
Electrical working	22	21	897	18	90.0	2	10.0	2
Abrasive material and glass working	14	12	730	9	75.0	3	25.0	2
Miscellaneous work on airplanes, seaplanes, ships, and musical instruments	15	14	1,834	8	80.0	2	20.0	5
Total	[2] 562	[2] 533	58,717	[3] 386	77.4	[4] 113	22.6	63

[1] Includes women employed only in the 533 firms which reported the number of women substituted as well as the fact of substitution.

[2] Seventeen firms substituting women in metal working occupations also substituted women on chemical, electrical, wood, textile, or abrasive material and glass working occupations; these did not report the numbers employed on either substance. Seven firms substituting women in woodworking occupations also substituted women on textile and miscellaneous work.

[3] Twenty-two firms substituting women on two materials reported their work to be satisfactory in each group.

[4] Two firms substituting women on two materials reported their work to be unsatisfactory in each group.

METAL-WORKING OCCUPATIONS.

In metal-working industries by far the largest replacement occurred in the machine shop, the department in which metal castings or forgings are reduced to the sizes and shapes desired by cutting machines. Very few women were employed in the smelting and refining of iron ores, copper, or brass, those employed being chemists' assistants, crane operators, or laborers. Over 1,000 took men's places in working metals into rods, tubes, bars, sheets, or wire. Less than 500 were employed in the foundries, largely as core makers, but also as molders, as laborers, and as machine operators. Some women were substituted in the drafting rooms, on layout work, or in the tool room. Over 1,300 did assembling work. The rest, or about 33,000, worked in the machine shop, operating machines, inspecting, or doing miscellaneous handwork.

The facts regarding the substitution of women in the metal trades are shown in Table 30:

TABLE 30.—EXTENT AND SUCCESS OF SUBSTITUTION OF WOMEN FOR MEN DURING AND AFTER THE WAR, EITHER THROUGH DIRECT REPLACEMENT OR THROUGH EXPANSION, IN METAL-WORKING ESTABLISHMENTS.

Branch of industry.	Firms.		Total women substituted.	Firms reporting women's work.	
	Substituting women.	Reporting number of women substituted.		As satisfactory or better than men's.	Not as satisfactory as men's.
High explosives and shrapnel shells	21	21	8,327	19	.....
Metal work on automobiles and parts	26	26	5,709	17	4
Machine guns and rifles	3	3	3,197	3	.....
Metal work on airplanes and seaplanes	7	7	2,726	5	.....
Grenades	8	8	2,413	6	1
Tools	12	12	1,578	9	3
Brass and bronze products	12	12	1,169	8	4
Other sheet-metal products	5	5	1,135	2	.....
Small office and household machines	11	11	1,060	9	2
Agricultural implements	14	13	840	10	4
Tin and aluminum containers	10	8	833	10	.....
Machines and machinery parts	18	18	783	14	4
Rods, tubes, bars, and sheets	10	10	737	8	2
Cannon and cannon mounts	5	5	704	5	.....
Railway cars and equipment	7	7	631	7	.....
Cartridge and shot shell	2	2	621	2	.....
Hardware and miscellaneous machine-shop products	13	13	521	10	3
Metal work on optical and photographic supplies	6	5	512	4	1
Foundries	20	19	489	17	3
Steam and gasoline engines	10	10	370	8	1
Torpedoes	1	1	361	1	.....
Pistols and revolvers	2	2	355	2	.....
Wire and wire goods	8	8	325	6	1
Metal work on electrical apparatus and supplies	11	10	314	8	1
Instruments	13	12	305	10	1
Clocks, watches, and cases	5	4	275	5	.....
Stoves and furnaces	6	6	265	6	.....
Metal work on musical instruments	2	2	215	2	.....
Motor cycles and bicycles	4	3	152	2	1
Jewelry	5	5	138	4	1
Metal furniture and fixtures	2	2	138	1	1
Metal work in chemical plants	5	5	127	4	1
Navy floats	1	1	100	.....	1
Metal work on stone, clay, and glass manufactures	1	1	63	1	.....
Cutlery and saws	4	4	61	4	.....
Silverware and plated ware	4	4	55	3	.....
Smelting and refining iron ore	5	5	37	2	3
Smelting and refining copper and brass	2	2	20	2	.....
Needles and pins	1	1	13	.....	1
Rolled gold	1	1	9	1	.....
Total [1]	278	267	37,683	212	44

[1] Twenty-five firms substituted women on two different metal products. Each is included only once on the totals for all metal products. Twenty-two firms did not compare the work of men and women.

About 83 per cent of the firms, comparing the work done by women on metals with that done by men, stated that they considered the product of the former to be as satisfactory as, or better than that of men. Only a few of the firms comparing the results based their comparisons on output records of men and women working on the same work at the same time and under identical conditions. In many plants this was impossible because the men were not kept on the work after women had been employed in any number. Many other differentials enter into factory work which make accurate comparisons difficult. The value of the firm's statements is therefore a

general one and may be regarded as indicating that the output, the discipline, the contentment, the attendance, or the turnover of women workers were all equal or poorer than or better than that of men workers, or that one or several of these quantities were such as to offset the other factors in which the sexes appeared to be of equal value.

Table 31 lists the principal metal-working occupations in which women were substituted for men and gives facts regarding the extent of substitution, its success and its permanency.

TABLE 31.—PRINCIPAL OCCUPATIONS ON METALS IN WHICH WOMEN WERE SUBSTITUTED FOR MEN DURING THE WAR PERIOD, THEIR RELATIVE OUTPUT IN THESE OCCUPATIONS, AND FIRMS RETAINING THEIR SERVICES IN AUGUST, 1919.

Occupation.	Firms substituting women.			Women substituted.	Men displaced per 100 women substituted.
	Total.	Per cent of total firms substituting women on metals.[1]	Total reporting number of women substituted.		
Inspecting	83	29.9	59	4,721	
Assembling	81	29.1	43	1,322	
Punch press operating	72	25.9	56	1,319	
Drilling machine operating	123	44.2	72	1,278	
Lathe operating	91	32.7	53	1,112	
Filing and other bench work	37	13.3	23	824	
Milling machine operating	63	22.7	34	809	
Soldering	16	5.8	8	595	
Grinding and polishing	53	19.1	35	429	
Core making	26	9.4	19	383	
Gear cutter and shaper operating	10	3.6	8	97	
Welding	14	5.0	7	97	
Crane operating	9	3.2	6	57	
Riveting	11	4.0	5	37	

Occupation.	Firms reporting relative output of women and men.				Firms reporting on retention of women, August, 1919.	
	Number.	Per cent reporting women's output as—			Number.	Per cent retaining women.
		Equal to men's.	Greater than men's.	Less than men's.		
Inspecting	67	44.8	20.9	34.3	59	71.2
Assembling	68	52.9	8.8	38.3	54	66.7
Punch press operating	68	51.5	25.0	23.5	49	59.2
Drilling machine operating	112	56.3	13.4	30.3	84	65.7
Lathe operating	83	54.2	14.5	31.3	60	56.2
Filing and other bench work	33	57.6	15.1	27.3	26	65.4
Milling machine operating	63	48.3	16.7	35.0	37	67.6
Soldering	12	50.0	16.7	33.3	13	53.9
Grinding and polishing	44	47.7	9.1	43.2	32	68.8
Core making	19	63.2	21.0	15.8	18	66.7
Gear cutter and shaper operating	10	10.0	50.0	40.0	7	85.7
Welding	13	76.9	7.7	15.4	12	50.0
Crane operating	7	42.9	14.2	42.9	7	28.6
Riveting	11	63.6	.....	36.4	8	50.0

[1] Two hundred and seventy-eight firms in the metal trades reported specifically on the occupations in which women were substituted for men.

The columns giving the numbers of firms substituting women during the war period and the proportion of firms retaining their woman employees in each occupation in the summer of 1919 are more

significant of the extent of the experiment in the use of woman labor and the foothold gained than are the figures on numbers of women substituted and on comparative output. This is true not only because many firms could not report the exact number employed or retained in each occupation, but because munitions manufacture plays the largest part in the numbers substituted in the war period and in the numbers dismissed after the war ended. It plays but a relatively small part in the number of plants substituting women and in the varied experience in metal working given to women. Statements regarding relative output of workers of either sex have great value, but there can be no better indication of the successful work performed by women than the retention of their services when the shortage of male labor was no longer acute.

The occupations shown in this table, together with less important ones, are described in the following pages and the causes of successes or failures recorded.

DRILLING-MACHINE OPERATING.

In no single occupation have so many of the firms included substituted women as in drilling-machine operation. One hundred and twenty-three firms out of 278 reporting on substitution in metal work employed women in this capacity. Not many firms kept records of the actual numbers employed on each type of machine in their shops so the total number of women substituted on drills could not be ascertained. However, 72 firms reporting definitely on numbers state that 1,278 women did work previously done by men, and all state that the replacement was one woman for one man.

Drilling involves cutting holes in metal pieces by means of a revolving, pointed tool. The material to be drilled is placed on the machine table and held in position by hand if the work is small, or in large work is securely clamped into place. The tool is attached to a spindle. In order that the hole may be drilled at the correct point and be of exact dimensions, it is customary to have the center and circumference of each hole drawn and prickpunched in the layout room before reaching the drill operator. Or, when many duplicate pieces must be drilled, the manufacturer has a mold, called a "jig," made, in which holes containing steel bushings or hollow plugs are the exact counterpart of those desired in the material to be drilled. When work comes to the operator from the layout room, she enlarges the center of the hole with a center punch in order to guide the drill point and then adjusts the work and table so that the drill tool will feed straight into the center mark. The power is switched on and the drill tool fed into the work by turning a hand lever. The drilling must be carefully watched in order that it may be of correct dimensions. When jigs are made for work, the operator has only to put the material into the jig and feed the revolving drill into it.

By far the largest amount of drilling done by women was jig work, although there are sufficient instances of layout work to state that women have done both kinds well. Drilling with jigs is considered the easiest work in a machine shop.

In addition to operating the machine, many women fasten the drill tool in its socket and grind it whenever necessary. In other

shops men are employed to take care of the setting up and sharpening of tools for the women.

Holes were drilled by women on material ranging in size from tiny instrument parts to machine bodies. The finest work was done on sensitive drills, the heaviest on large radial drills. On both sizes women proved successful. However, most of the work was done on light and medium machines having from 1 to 16 spindles. Not only were holes rough drilled on these machines, but they were reamed or perfected with a fluted tool to overcome drilling defects. They were tapped to produce internal screw threads. They were countersunk and counterbored to enlarge the upper end or to form a shoulder at the lower end of the hole.

About 70 per cent of the firms reporting on the relative output of men and women drill operators state that the women did as much or more work than men. Comparatively few of the firms reporting women's output as less than men's stated that women were unsuccessful on drilling. In these plants, some of which were small plants, women were changed about on drills, lathes, and milling machines and had not become proficient on any one machine. In other plants reporting failures on drilling machines the products made were engines, gun carriages, and agricultural implements, on the heavy parts for which women did not have the necessary physical strength to turn the feeding levers of the drilling machine without straining. The other firms gave as the reasons for a lower output of women than men: "Morning and afternoon rest periods;" "waiting for men to fix the machines;" "break their tools;" "irregular attendance;" "flirting with men;" "waste time." These causes of decreased output applied not only to drilling-machine operators, but to almost all woman workers in the shop. Flirting, wasting time, and other shortcomings in factory conduct were charges brought by few factories, however. As the great majority of firms stated that women were more attentive and conscientious than men, the unfavorable comments on conduct in the instances above noted were undoubtedly due either to conditions peculiar to the factories concerned or to the character of the local labor supply. Irregular attendance occurred where married women were induced to enter the factories in large numbers, for many of these women regarded the factory work as secondary in importance to their home duties. Breaking tools or damaging the machines beyond the usual amount was chargeable against the insufficient knowledge or carelessness of the woman operators.

Accurate figures on output for men and women doing identical drilling work under the same conditions were secured from three war-order firms. On drilling holes in 3-inch trench mortar shells, women's output was 40 per cent greater than men's.[1] Two establishments reported on drilling oil holes in stem gears and other machine parts. In one, men averaged 50 oil holes per hour, whereas women averaged 47; in the other establishment, women averaged 46 per hour and men 44. The men doing the work in the first establishment had been employed 3 to 6 months, the women 1 to 2 months. On radiusing and reaming the bore of differential pinions, two

[1] Figures from this factory were secured by the Women's Branch, Industrial Service Section of Army Ordnance Department.

LATHE OPERATOR—TURNING PINION SHAFTS.

Note taper gauge on the vise; also hammer for placing identifying mark on each piece turned.

women turned out 4,400 pieces per day. The record held by two men on this work was 3,200 pieces.

In the summer of 1919, when war orders were canceled and many of the soldiers and sailors had returned to their prewar work, 55, or almost two-thirds of the number of firms reporting on postwar conditions, had retained women as drilling-machine operators. Undoubtedly the success of woman war workers as drilling-machine operators in many industries, together with the prewar experiences in their employment in this capacity in a few industries, has made drilling one of the occupations permanently open to the peacetime woman worker.

LATHE OPERATING.

Lathes are used to perform a greater variety of operations than any other machines. While their particular function is to produce curved surfaces, they are frequently used to produce flat surfaces, to bore holes, to thread, to tap, to cut internal threads, and to do any other work when a specialized machine is not available. Except on large work and on automatic screw machines, a lathe operator must be much more than a machine tender. When she can not set up her work, test the cut and measure it, the demands made upon the foreman or machinist are too great to make the work done by women profitable. Wherever a factory is on quantity production a lathe operator may be assigned a single task. Under such conditions she need learn only enough about the machine, the tools, and the metals to do this type of work correctly. But even so the factory is dependent on her care in setting up, watching, and measuring the work for the quality of its output. If she is employed in shops whose work varies, she must learn to read blue prints, know the characteristics of different metals and tools, and be able to set up work of a varying nature.

Although there were operations on other machines which women performed that were as skilled as any performed on a lathe, as a whole the lathe work done called for more ability and judgment than did that on other machines. For this reason there were more failures registered than on some other kinds of work. Ninety-one firms employed women on lathes in men's places. Of the 83 reporting on output, 26, or 31.3 per cent, stated that women's output was less than men's had been, and 10 of the 26 reported definite failures. The causes for the failures were: "Slow in tightening up chucks because lacked sufficient strength;" "not sufficiently skilled to cut gauges, dies, and tools that were constantly varying;" "did not learn to set up machines;" "fast workers but made lots of scrap;" "not accurate;" "work too heavy to be lifted into and out of machine without strain."

As against this, 45 firms found the women's output on lathes equal to men's, 12 considered it greater than men's. Some statements concerning successes were: "Put it all over the men;" "pass better inspection, for girls detect faults at a machine;" "very successful on speed lathes on auto motor parts;" "on trench mortar shells, women Blood lathe operators turned out 20 per cent more work than men;" "on 155 mm. shells their average production was greater than that of men." Several firms employing women successfully on

heavy work had installed mechanical devices to aid in lifting and chucking the pieces.

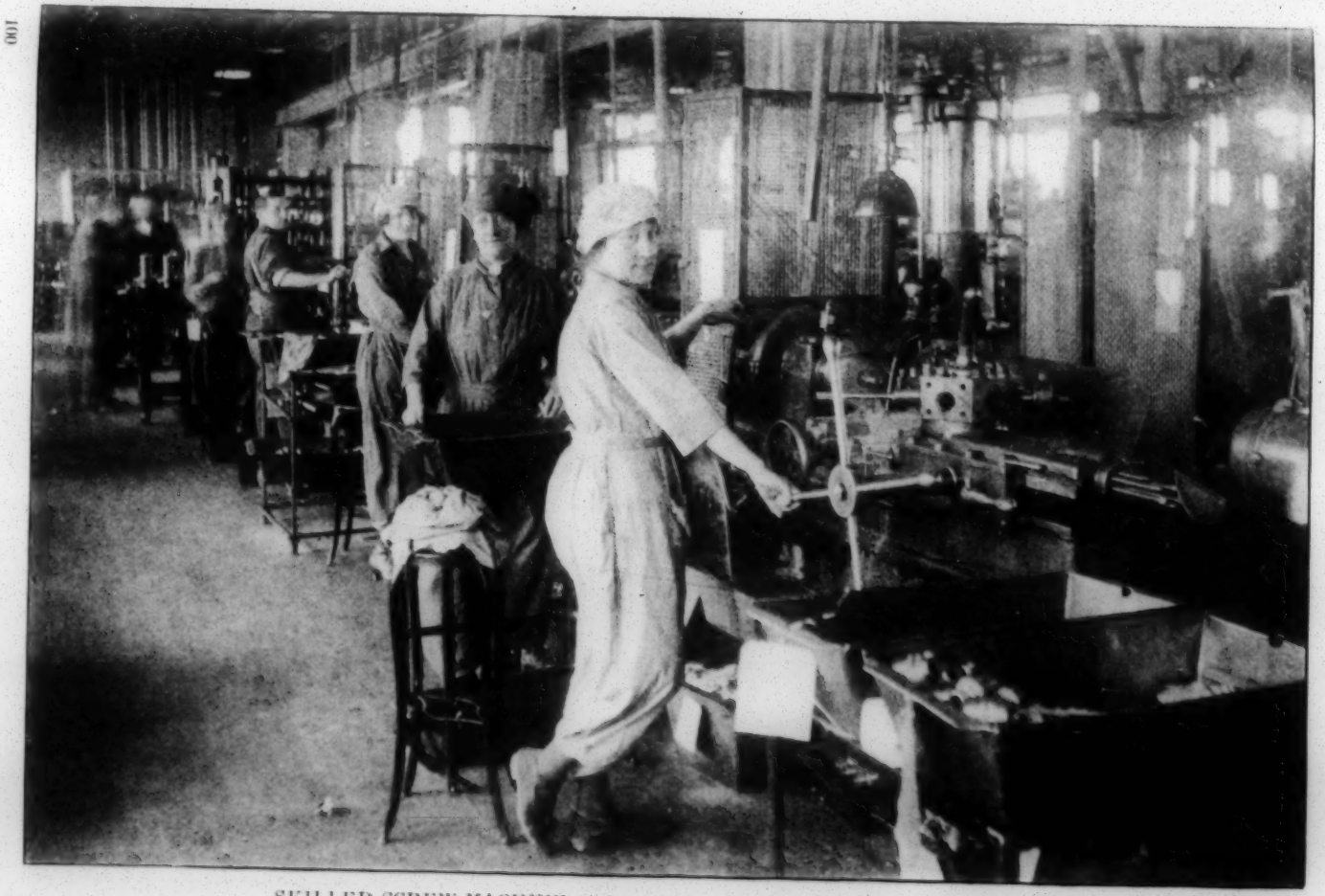
Although the shapes and sizes of the work done and the sizes and types of lathes operated by women differed widely, the underlying principles of operation were the same. On engine, toolmakers' and precision lathes the work to be turned must first be centered and a hole drilled in each end so that the work will fit over the lathe center. In large shops this is done by machine before the work reaches the lathe operator; in small shops the lathe operator must find the center and drill the hole. If the surface of the work is not flat, the lathe operator must level it before she can start on the turning operation. When this is done the work is ready to be set in the head stock which revolves it, or, in the cases of large work, in a dog, and the tail stock is moved up into position to hold the work steady. The cutting tool is fastened into the tool holder at a proper angle either by hand or by aid of compressed air. When the power is turned on, the work revolves at a fixed speed against the tool which is moved laterally with each revolution of the work. On speed lathes the tool is held in the hand and pressed against the moving metal. Eight firms employed women on this type of machine, whereas 46 firms put them on engine, toolmakers' or precision lathes.

On turret lathes, several tools are held in a turret so that one after the other can be brought in contact with the work in rapid succession. The operator applies the tools to and removes them from the work by turning a hand lever, but the turret rotates automatically to bring each tool into line. Thirty-two firms employed women on this type of lathe to cut bars or rods which had been put through a hollow spindle in the head stock and fastened in a chuck. Of the 20 firms reporting on the relative output of women and men on these machines, 5 stated that women produced as much; 5 that they produced more; and 10 stated that women produced less than men.

Automatic screw machines are used to accomplish by cams and levers what is done by hand on a hand screw machine. Their mechanism is complicated and can only be set up by an experienced machinist. The few girls operating these machines simply tended a number of machines.

Although women were employed on lathe operating in factories making many varied parts, their employment as lathe operators was heaviest in munitions plants. The kind of work they did successfully in these shops is illustrated in the following list of operations on shell bodies. The shells cut by women weighed from 19 to 100 pounds, varying with the size of the shell and the distance it had traveled through the shop on its way from forging to finished shell. On heavy shells, chain falls or block and tackle were used to lift the rough forging from the table or truck to the lathe and to lift it out when the operation was completed. Pneumatic chucks saved adjustment by hand and eliminated physical strain. On the following operations marked with an asterisk (*) girls set up the work, tested the cut, ground the tools, shifted belts, and cleaned machines:

*Rough turning to repair eccentric forgings on shells.
*Rough turning shell body on engine lathe fitted with turret and on turret lathes.
Rough facing base end square with body on vertical turret lathe.
Finish facing base end and finish turning base.
*Boring and reaming end of thread on turret lathe.



SKILLED SCREW-MACHINE OPERATORS IN THE AIRCRAFT INDUSTRY.

*Tapping fixing screw on tapping lathe.
*Finish turning shell body on engine lathe.
Boring and facing on special purpose lathe.
*Cutting on hand screw machines.
Turning and forming driving band on engine lathe with special forming slides or on brass lathe.

In spite of some failures, women have demonstrated their ability to run lathes. With less experience than men operators, they have equaled or exceeded the men's output in 57 out of 83 firms comparing the work done by men and women lathe operators. Their success in lathe operating is of greater value to their ultimate success as machinists than their success at any other machine. For the lathe is the parent machine; from it have grown the many special machines designed to turn out work faster and more accurately than the lathe can. When its principles of operation are thoroughly mastered, the principles of other cutting machines can be easily learned. And in spite of the special machines on the market, the lathe continues to play a most important part in machine-shop work. The fact that more than half the firms reporting on 1919 labor conditions were continuing to employ women as lathe operators, has, therefore, very real significance. Especially is this true in view of the fact that the most extensive employment of women as lathe operators was in the manufacture of an exclusively war-time product.

MILLING MACHINE OPERATING.

In no other occupation has so much enthusiasm been shown by employers for woman's work as in milling. Each one of the 63 firms employing them in this capacity reported favorably on their work. Undoubtedly one of the elements entering into this success is the fact that milling machines are used largely for cutting the surface of small metal parts so that little physical strain is involved in the work.

The miller cuts by means of one or more circular cutters having a number of teeth. The cutters rotate while the work is fed beneath them in the required direction. The operator is provided with a blue print giving the particulars concerning the cut to be made. She sets up her cutter or cutters accordingly. The driving and feed mechanism are adjusted to give the correct speed to the cutters and the feed. The piece to be milled is fastened securely to the machine table which is then raised to a height that will permit the cutters to give the required depth of cut.[1] On automatic machines a trip dog is set so that the feed will stop at a predetermined point. The operator then takes a test cut of the work. If the machine is correctly set-up, the power feed for the table is engaged and the material is automatically fed back and forth under the cutters until the cut is completed.

After the work is set the operator need only watch the machine, regulate the lubricant flow and brush the grindings from the path of the cutter. When the cut is finished the work must be carefully measured. An experienced operator tends several automatic machines at one time. On some machines, however, the work must be fed back and forth under the tool by turning a hand lever. The operator may

[1] On some machines the cutters are lowered to the work.

sit at her machine while doing this. Many firms report that only a limit of 0.001 inch was allowed on milling work.

To set up work correctly in milling machines requires judgment and skill, as the arrangement of the cutters, the elevation and angle of the table, and the speed vary with the character of the work to be done. To operate the machine after it is set up requires little skill. While many of the pieces milled by women were done in sufficient quantity to make the setting up of the machines infrequent, when it needed to be done, it was done by women in the majority of plants reporting. Some women were able to set up their machines and grind the tools after a month in the machine shop; others needed longer training and experience extending, according to some statements, to a year's time.

Women operated milling machines on a variety of operations and the types of machines used were numerous. Among the operations performed were:

Milling square surface on steering knuckle within limits of 0.001 inch.
Surfacing, rough and finish threading and throating chasers within limits of 0.001 inch.
Facing and radiusing elevating arch within limit of 0.001 inch.
Milling saw teeth.
Milling picket heads weighing 25 pounds.
Profiling gun parts.
Plain horizontal millers, universal, vertical, Lincoln and multicut and straddle machines were among those operated by women.

All of the 63 firms substituting women for men expressed complete satisfaction with the milling done by women, as already stated. Twenty-two firms, however, believed her output on this and all other work done by her in their plants to be somewhat less than men's.

Their reasons do not apply to milling in particular, but are of a general nature. Shorter working hours, lack of convenient accommodations, and difficulties in discipline were the prevailing comment, though in no case was the drawback regarded as serious enough to mark the work of woman mill operators as even closely approaching failure. Forty-one firms of those comparing women's and men's output state that women did as much or more work than men. One firm reports that it was able to eliminate a night shift of men when women did the threading of shell noses on the day shift. On actual output another firm reports that men's average per hour on milling firing pins for fuses was 156, women's 400. In a second firm men with from 1 to 2¼ years' experience milled 30 oil ways per hour while women of from 1 to 6 months' experience milled 32 per hour. A third firm's production records show an average of 58.1 pieces for men against 70.7 pieces per hour for women.

Twenty-five of the 37 firms reporting are continuing the employment of women on milling machines, some few having increased the number employed in this capacity since the armistice. It would appear that, if not, as one employer said, the "milling of small parts is now a woman's job," at least it has become, in the words of another employer, "as much a woman's as a man's job."

TOOLMAKER.

She repairs the teeth for inserted blade cutters, flutes taps and reamers, and does general milling machine work.

GRINDING AND POLISHING METALS.

When only a small amount of metal needs to be removed from work to bring it to correct measurements or when a smooth surface is desired, work is ground or polished. This is done by revolving sandstone wheels or wheels covered with sharp angular grains of emery, corundum, or carborundum against the object or by revolving the object against the wheel. Grinding differs from other cutting processes in that the surplus metal to be removed is reduced to a powdered state during the grinding. For this reason exhaust hoods are placed over the wheels to catch and draw off the fine metal particles. Grinding is done either by hand or machine. Polishing is usually done by hand. In hand grinding or polishing the workman holds the piece in his hands and presses it against a revolving wheel. Success depends entirely on the skill and touch of the workman. A machine grinder is operated like a lathe, the grinding wheel corresponding to the cutting tool in lathe operating as the part of the machine which comes in contact with the work. The carriage on which the wheel is mounted may be moved along the base either by a hand lever or automatically.

Fifty-three firms employed women in grinding and polishing metal parts for the first time in 1917 or 1918. In addition to this, wherever it was the shop practice for machine operators to grind their own tools, women did this work with hand grinders whenever their cutting tools were dulled. Sharpening the tools takes but a few minutes during the day, but as the accuracy of the shape of the tools depends entirely on the skill of the hand grinder, when woman machine operators accomplish this task successfully, it may be considered a real achievement. Ohio and New York State laws forbid firms to employ women on abrasive wheels, consequently it was not the general practice in these States to teach women the art of tool grinding. These State restrictions serve not only to exclude women from the occupations of grinding and polishing, but act as a handicap to their employment on all machine tools, since in many machine shops it is customary for each machine tool operator to grind his or her tools. In the two States forbidding this, firms must hire extra men to take care of the women's tools. The reason assigned for the exclusion of women from this work by people interested in the protection of the health of women is that the metal dust produced in the operation is more dangerous to women than to men. All modern grinding and polishing machines are equipped with exhaust systems which, according to tests made by Dr. L. W. Chaney, of the United States Bureau of Labor Statistics, an expert in industrial hazards, adequately remove the metal dust from the room. If modern machine builders have eliminated the health hazards on grinding and polishing, it would seem a wiser provision for all States to insist that adequate exhaust systems be installed so that the health of men as well as that of women could be safeguarded rather than that the protection of the health of women be paid for at the needless price of her exclusion from an occupation that is profitable and can easily be made safe and healthful for both men and women.

About 57 per cent of the plants in which women operated grinders on parts that were being manufactured reported the output of women to be equal to or greater than that of men. Many of the machines

were automatic, but the work had frequently to be ground to a limit of 0.002 inch. These operators took their own readings, set up and cared for their machines, and sharpened their stones. One firm reports that on automatic saw grinding a woman operated 14 machines, while a man of longer experience operated 5 machines.[2] In another establishment the average output per hour of women on rough and finished tool grinding was 14.38 pieces per hour, while the men's output was 8.42 pieces. The women's experience in the factory had not exceeded 4 months; the men's reached 11 months. "Women have better eyes for symmetry," said a manufacturer who employed them to grind the bore of cylinders.

A firm that reported a smaller output for women polishers than for men polishers stated that the quality of the work done by women was better than that done by men. The wrist strain was found to be too great on hand grinding of chisel points by another firm. On very fine metal work, although women did it well, their output was not as great as that of men. On heavy work some factories reported they required assistance in lifting work in and out of the machines, as no mechanical aids were provided.

Only 32 firms stated whether or not they expected to retain the services of the women as grinders or polishers. Twenty-two, or over two-thirds of these, expect to continue employing them in these capacities.

PUNCH-PRESS OPERATING.

Presses shape metals in an entirely different manner from the machines considered in the foregoing pages, for in them a ram carrying a punch falls upon the metal which has been placed over a die. The die determines the external form of the work, the punch the corresponding internal shape. If the punching tool is sharp it cuts the metal to the required form in one fall; if it is smooth, by steady pressure it will cause the metal to "flow" into the desired length or bend it into the desired shape.

These machines are not new to women. Women have been blanking and shearing sheet metal, drawing brass cups into cartridges, curling the edges of kitchen utensils, swaging and pointing pins, trimming and notching for many years before the World War. They have operated small machines on very light work; they have operated heavy presses on medium work. They have operated machines in which the traveling ram falls upon the work at the turn of a hand lever; they have pressed a foot treadle to cause it to fall; they have fed work into machines where the ram was operated by power or by hydraulic pressure. They have worked at guarded and unguarded punches. They have had their fingers cut off and their hands mangled, and no State laws have prevented women from working on punch presses. In a report issued by the U. S. Bureau of Labor Statistics, the accident frequency rate on machines in fabricating departments of the iron and steel industry is greatest on "presses and punches" of any machines with the sole exception of reamers.[3] In

[2] Figures from this factory were secured by the Women's Branch, Industrial Service Section of Army Ordnance Department.

[3] U. S. Bureau of Labor Statistics. The Safety Movement in the Iron and Steel Industry, 1907 to 1917. Bulletin 234, p. 267. Washington, 1918.

an earlier report [4] of accidents on machines in 18 firms, 80 per cent were on punch presses, the rate for women being higher than for men.

Having already established herself in this occupation before the war, it is but natural that with the demand for metal workers during the last years should have come an extension of her employment to establishments that had previously used men on presses and to presses larger in size than those she had been operating.

Seventy-two firms reported that they had used women on men's work on presses during the war. Some of the work was on automatic presses. This is especially true of cartridge making, where the brass piece was cupped, drawn, headed, and tapered on automatic presses which the operator sometimes fed by hand, but which were more frequently fed automatically. On automatic cartridge machine feeding one firm reports that two girls do the work of three men.

Other work was on small foot presses. The worker slips the metal over the die and brings the punch into position by foot pressure on a trip. Women's fingers were said to be "better adapted than men's" to this kind of work on balance wheels for clocks. Still, other machines cut one revolution before locking, the girl holding the blank with pincers while the punch repeatedly fell upon it. Copper bands were pressed on the shells on hydraulic presses. The woman operator inserted the shell into the press and turned on pressure sufficient to force the band on the steel. None of the work done required much skill. On the medium and heavy presses the dies and punches were changed by men; on light presses some factories employed women to set up all machines. Women cleaned their own machines. Over 76 per cent of the firms reporting on the relative output of men and women stated that women's production equaled or exceeded men's. Women were retained in 29 of the factories in which they had been substituted; 23 other factories did not report on post-war labor conditions. The operation of the press is not a highly skilled occupation; it does not constitute a link in the chain of related and up-graded occupations and therefore does not offer conspicuous opportunities for profitable advancement. But there is little doubt that the punch press is the most dangerous machine that women have operated. Unless the point of operation is safely guarded in an inattentive moment the hand may be caught under the falling punch. The operations performed on punches are such that what may serve as a most effective guard for one kind of work might hinder the cut on another type of work. Safety engineers have devised several effective kinds of guards for punch presses, so there is little excuse for employing men or women on unguarded machines. Unfortunately, however, some manufacturers content themselves with putting a frame about the punch which is intended but does not succeed in keeping the hands away from the punch.

MISCELLANEOUS MACHINE OPERATING ON METALS.

The machine operations treated in the foregoing pages are common to all metal machining industries. There are many other machines used in making special products. Women were employed on these

[4] U. S. Bureau of Labor Statistics. Employment of Women in Metal Trades. Summary of report on conditions of women and child wage earners in the United States. Bulletin 175, p. 319. Washington, 1916.

special machines to a much less extent than on the more generally used machines. Data on the more important special work done follows.

Two firms report that women operated hand and automatic planers. While the automatic planing involved no strain after the work had been set up, the hand planers used foot levers to start the planer bed on its outward stroke and hand levers to bring it back into position while radiusing. These girls fastened their work to the planer bed, clamped the cutting tools in place with hand wrenches, and operated the machines. A craneman carried the work to and from the machines. One firm employed women to operate Cincinnati shapers on parts of the breech mechanism.

Ten firms employed women on automatic gear cutting or shaping machines to cut spur and bevel gears. These machines were usually set up by men, since the cutters weighed as high as 100 pounds. Five firms stated that women's output surpassed men's, one firm claimed it was equal to men's, and four firms reported the output of women as less than men. The reason given for the lessened output was that the blanks from which gears were cut by women in these four factories were too heavy for women to put in and out of the cutters readily. Six out of seven firms reporting on this point are retaining women as gear cutters or shaper operators.

Six firms reported that women had been substituted on engraving machines. Power hack saws and burrs were operated to cut off ends and to remove roughnesses. Automatic slotting machines were used for screw making. Automatic cutting, honing, and stropping machines were operated by women on razor blades.

Under riveting, four distinct kinds of work were performed by women for the first time during the war in some establishments. In six firms women operated a riveting machine which pressed rivets into two metal plates, thus connecting them securely. The operator placed the rivet on the plates. By pressing on a foot lever a die was dropped upon the rivet, closing it. In five firms women worked as a part of a riveting gang. They heated the rivets at a forge and tossed them to their fellow workmen. In one plant a woman acting as rivet heater for two gangs of men was going to quit work because of insufficient pay. But the men chipped in among themselves and raised her wage to $2 per day, as it was money in their pockets to have her stay. A woman acted as "holder up" in only one plant. In this occupation she pressed a hammer against the head of the rivets while the riveter beat on the rivet. Eight firms reporting on the 1919 labor force had retained the woman riveters or rivet heaters.

In turning iron, steel, brass, and copper into rods, bars, wire, or sheets, machines are used that differ entirely from those used in cutting forged or cast parts to size. Women were substituted for men on but a few of these machines. They fed and guided strips through rolls which gradually reduced the metal to the desired size, one girl standing on the feeding side, another on the receiving side of the rollers. They placed tubes between rollers on presses to straighten them. They cut or trimmed sheets to specified lengths on shearing machines. They fed plates into slitting machines and removed them after they had been cut into smaller sizes. Scrap was cut up on alligator shears and balled on automatic machines. None of this work required much skill; it is more akin to manual labor. Undoubtedly much of

it entailed heavy lifting, as two firms state that women were not strong enough to succeed in their mills. But data on the actual size and weight of the ingots handled in the eight mills in which women were satisfactory were not available.

In wire making, whether in wire factories or in electrical plants, women wound wire on bobbins. The loosely coiled wire was brought to their machines, the ends were drawn through swifts and over trolleys onto the revolving bobbins, the operator merely tending the machine after it was threaded. The bobbins were then taken to stranding machines where the wire was twisted into rope under the watchful eyes of the woman operators. Other wires were braided; that is, insulated with tape and cotton thread. Women tended a number of braiding machines, the work consisting of threading the machine and watching the taping and braiding. If the insulating is not done correctly, the wire must be pulled back to the place where the error occurred and the work done over. When these machines are not equipped with automatic stops pulling heavy wire back on the reel is heavy work. This and the placing and removing of the wire spools on the shafts is the only heavy work entailed in these wire-making occupations, and usually men are employed to attend to these tasks.

CRANE OPERATING.

This was performed by women in steel works, rolling mills, and in machine shops, nine firms having employed them in this capacity. Great difficulty was encountered in securing women who were able and willing to spend their working hours riding high above the floor in cages, lifting by machines and shifting by machinery heavy pieces about at the orders of the men. Four of the nine firms did not think the women employed as able as their men crane operators.

When an efficient woman was secured who could do the work and liked it, she seems to have made an exceptionally fine crane operator. She is reported to be a better judge of distance, to be quicker, to be more careful of the lives of the workers beneath her and to meet with fewer accidents. At the Watertown Arsenal the men in the forge shop requested that the woman crane operators be retained. Two of the seven firms covered which reported on their 1919 labor force retained their crane women. As a whole, however, this did not prove to be an occupation especially well adapted to women.

CORE MAKING.

Women had been employed in foundries as core makers for many years before the World War. In the last few years, however, their employment in this occupation has not only been extended to factories which had never employed woman labor before, but their services in plants in which they had worked on simple, light cores for 15 or more years have been used on the more intricate and heavier cores.

Among the establishments reporting on substitution during the war 26 included core making among the new occupations for women in their plants. Seven of these firms were making castings of agricultural implements; the others were doing a jobbing business in

castings or making stove, shell, car-wheel, locomotive, automobile, or grenade castings.

Cores—parts of molds occupying the spaces that are hollow in the finished castings—are made either by hand or machine. The hand core maker stands or sits on a table on which a supply of sand is available.[3] The mold which she uses is made in halves and is called the "core box." The halves are securely clamped together while she fills the hollow box through an aperture with the sand in which adhesive materials have been mixed by the foreman. With a mallet she rams nails and wire into the sand to add to its firmness. When the sand has been rammed into all the hollows and several vent holes made she opens the core box and turns the perfectly formed core out onto a metal plate. Success depends on the proper ramming of the box and on the deftness with which the core is turned out. The core will fall apart if it is not firmly made or its projections and corners will get broken if the box is opened clumsily. The same care must be bestowed on each core made or it will not turn out a perfect one, in which case it must be done over again. To be able to make cores of many shapes quickly and perfectly requires dexterity and experience. The simplest small cores can be made successfully after a few days' experience—in fact some women can do them after a few trials—but experience is needed to learn how to ram and turn the more intricate shapes.

In machine core making, sand is fed into the machine through chutes from the floor above or by shovel. It is then blown into the core box by compressed air. The core maker removes the rammed box and turns it out onto the plate as in hand core making.

The cores made in foundries vary in size from 1 inch to many feet and the range in weight is correspondingly large. Lack of muscular strength in arm and wrist prevents most women from making the heavier cores successfully unless mechanical devices are provided, as she must handle the core box filled with sand easily and must be able to lift plates with a number of cores to shelves from which they can be taken to the bake ovens. The heaviest core made successfully by hand by women in the 26 firms which reported replacing women by men weighed 45 pounds. Another firm stated that on cores in the making of which pivots, hoists, and hinges were a regular part of the shop equipment, the highest record held by men on the size under consideration was 70 per day whereas a woman attained the record mark of 160 per day. On the other hand, the three firms stating that women's core output averaged 75 to 90 per cent of men's, said, "The work was too heavy for women."

Just as the point at which core weights become too great for women to handle successfully from the viewpoint of output varies in the opinions of employers, so the amount at which core weights become too great for women to handle from the viewpoint of health varies in fixed standards. Pennsylvania and Ohio limit the combined weight of core, core box, and plate that women may handle to 15 pounds, New York statute fixes a 25-pound limit, whereas Massachusetts limits weights to be lifted by women to 40 pounds. The Foundry Safety Code of the American Foundrymen's Association and

[3] Clay is used for loam molding, sand with adhesive materials for green sand molding.

National Founders' Association states, "No female employed in a foundry shall lift any object exceeding 35 pounds in weight unless she uses mechanical means by which her effort is limited to 35 pounds."

That women make successful core makers not only on small cores but on medium-sized cores is evidenced by the fact that over five-sixths of the firms reporting on the comparative output of men and women stated that the work of women was equal or greater than men's in quality and quantity. There seems to be nothing inherent in the making of small cores themselves that can be classed as heavy or unhealthful work, and there is much that is attractive. Opposition to the employment of women as core makers has arisen from other causes. First, the molders' union considers core making as one part of a molder's apprenticeship. Women enter the foundry as core makers and continue to be core makers through the years, thus cutting off one stage in the training of the man apprentice. So opposed are the molders to the entry of women into foundries that women are not only barred from their union but they endeavor to stop the extension of their employment in the industry.[5] Secondly, core making has been frowned upon as an occupation for women, because it was often done in a corner of the foundry proper amid heat, smoke, fumes, and dirt, or in a poorly ventilated room near a bake oven, from which smoke escaped. Advanced foundrymen recognize that such a condition entails needless exposure for either men or women core makers. The zinc oxide fumes arising from molten brass cause "brass colic" in both men and women, although it is claimed that women and boys fall victims to the disease more readily.[6] The smoke in the malleable and gray iron foundry and from bake ovens is irritating to many workers of both sexes. Modern foundries have their core rooms entirely cut-off from the melting and baking rooms. The atmosphere is as free of disturbing or harmful elements as an office room. The sand is fed through a chute to each worker and the plates are carried to and from her bench on an overhead trolley or on moving belts. The noise of machinery of the usual factory is absent.

All core rooms could be as pleasant as many already are. The laws of Pennsylvania and New York and regulations of the State Board of Health of Massachusetts prohibit the employment of women in rooms that are not free of the foundry fumes, gases, smoke, and heat. The laws do not, however, prohibit the making of cores in such surroundings as long as women are not the core makers.

Women have been so successful in small core making that two-thirds of the firms reporting on post war conditions are continuing to employ women in this capacity. In the words of one foundryman: "Women have come to stay in the core room. * * * Only by elevating core making to an attractive occupation can foundrymen hope to hold the services of efficient women workers."[7]

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[5] See the International Molders' Union rules expelling members who teach women any part of the molders' trade. Appendix B, p. 158.

[6] Hayhurst, Emery R., A. M., M. D., Occupational Brass Poisoning; Brass-founders' Ague, p. 5.

[7] Employment of female labor in the foundry, by W. L. Churchill, The Foundry, December, 1917, pp. 519-520.

WELDING.

Fourteen firms reported that women were employed either as acetylene or as electric arc welders in positions at one time held by men. These women fused together small steel and aluminum parts, plates, wires, radiators, shells, and tubes. In acetylene welding the parts are placed in holders, the torch is lighted and the flow of acetylene and oxygen regulated until the correct flame is secured. The torch is then applied to the edges to be welded. As they melt, a wire is heated and allowed to drip over the seam. On tubing, the torch is held in a machine while the seam of the tube passes through it automatically. In electric arc welding the two parts are placed in adjustable holders and are brought close together. As the current is turned on, it jumps from one piece to the other, causing them to fuse.

In both types of welding the light which the worker faces is excessive. Sometimes the eyes are protected by a mica screen placed between the operator and the work; more frequently colored goggles served as a protection.

There is considerable sparking in electric welding, which causes the molten metal to spatter in all directions. To prevent burns many women wear gloves and some shield their faces with masks.

About 85 per cent of the firms stated that women's output was as good or better than men's on the work done. One shipbuilding firm found, however, after some experiments, that welding in shipbuilding was "too hard, too hot, and too dangerous" for women. Half of the establishments reporting on 1919 labor conditions had retained women as welders.

SOLDERING.

Soldering is not new work for women, but 16 firms stated that they had employed women on this work during the war for the first time. Most of the firms manufactured various articles of sheet metal, such as cans, kitchen utensils, lamps, oil stoves, and jewelry. The parts to be cemented were cleaned and a flux applied. The workers fused solder on the joint by means of a heated copper bit or a blow-pipe flame.

Although this work requires little skill, one-third of the firms stated that women did less work than men. A little over one-half of the firms had retained women as solderers in the fall of 1919.

INSPECTING.

Women had earned a reputation as inspectors many years before the metal working industries employed woman labor. Examining cloth for flaws in weaving, clothing for faults in sewing, food for bad spots, and cans for tiny leaks had trained women's eyes, quickened their sense of touch, and developed the habit of constant alertness. But they needed more than this to succeed in the machine and instrument shops. Here very often parts have to be accurate to the thousandth of an inch. Women employed as inspectors had to learn how to use gauges, read micrometers, and vernier calipers. Many learned to read blue prints and to use the scleroscope.

Eighty-three firms, or about three-tenths of the metal manufacturing firms reporting on the occupations in which women were employed for the first time in their factories, used women as inspectors. Only 50 reported the actual numbers employed in this capacity, but these alone had 4,721 inspectors—a larger number than was substituted in any other occupation in metals. Women inspected raw materials, made floor and final inspections. In shell manufacturing alone they gauged the external and interior measurements eight times. For interior measuring a paddle gauge was used; for the head tap test, a standard screw; while micrometers told the accuracy of the external cuttings. These inspectors did not have to lift the heavy shells, for they were moved past them on rollers. In brass and copper mills, women inspected and tested rods and tubes after the drawing and in the finishing room. All parts of gun sights were scrutinized by women. Many parts of machine guns, pistols, and revolvers were gauged for inaccuracies. Piston rings, gears, screws, and other machine engine and motor parts were carefully examined. Some women became expert in inspecting tools and checking them over with drawings after they had come from the tool shop. Many other plants depended very largely on women to catch faulty castings or machinings.

About two-thirds of the firms reporting on the relative output of men and women inspectors declare women to have been as fast or faster than men. One firm states that its records show women to have turned out 20 per cent more than men on 3-inch trench-mortar shells. But more indicative of their real success is the fact that over 70 per cent of the firms reporting on 1919 conditions had continued to employ women for inspection work.

BENCH WORK AND ASSEMBLING.

Much of the other work done about a foundry or machine shop is of necessity hand work. When the parts are of a size that can be worked on at a bench to advantage, it is commonly called bench work. Over 13 per cent of the firms reporting on occupations in which women were substituted for men on metals stated that women were employed at bench work. Some of the work reported under assembling and inspecting was bench work, and in all probability some of the work reported under bench work was assembling or inspecting. For statistical purposes, however, the three groups are tabulated as reported on the schedules.

One of the operations which women performed at a bench was chipping castings. The casting was fastened in a vise unless it was sufficiently large to be stable without being held. The girl held a chisel at the point at which the casting was to be cut while she struck it with a hand hammer or pneumatic hammer. Where the hand hammer was used, muscular exertion was necessary; when the blow was struck with a pneumatic hammer, air furnished the pressure, the women simply regulating it by pressing on a trigger.

Filing was done by women to a much greater extent than chipping. Eleven firms reported that women were worked full time on this operation. Here, too, the work is usually fastened in a vise while the woman runs a hand file back and forth in a straight line over the surfaces to be finished. Standing is usually necessary on outside surface filing,

as muscular strength must be exerted to finish the surface properly. Corner filing can sometimes be done while seated, the object being held between the knees. Seven out of 10 firms, comparing output, stated that women did as much or more work than men. Only three out of eight firms reporting retained women filers in 1919.

Included in bench work, especially in electrical and instrument factories, is the operation of small drills , small lathes, small punches, broachers, taps, and reamers. These tools are used to drill, bore, and finish small or irregular parts. The handsaws were also used to cut off ends.

A few women were employed in "laying out," that is, marking pieces in such a manner that the machine operator will know the exact location and nature of the operation to be performed. This involved a careful reading of blue prints, and accuracy in the use of drawing and measuring instruments. It is probably as skilled work as any performed by women in machine shops, and is therefore significant, even though but a few women were involved.

Nearly 73 per cent of the firms comparing output stated that women equaled men on bench work. Approximately two-thirds of the number of plants reporting on 1919 conditions had retained women on these operations.

Women had been employed as assemblers of small metal parts before 1914. The war not only extended their employment for the first time in this capacity to many factories making delicate machines or instruments, but it sent them into machine shops where parts of medium size were assembled. During 1918 women were substituted for men in assembling very delicate instruments, locks, typewriter parts, sewing-machine parts, adding-machine parts, rifles, airplane parts, hardware, cutlery, tools, gears, transmissions, and joints of automobiles; centrifugal governors, and radiators for engines; electric motors, switches, and switchboards; bombs and shells; in the assembling of many other parts; and in aiding in machine erection.

Many processes were involved in the assembling done. Not only were all of the tools named under bench work used by assemblers, but the machine screw driver and power riveter played important parts. Soldering or painting or lacquering was sometimes a part of the assembler's work.

As shown in Table 33, 81 firms reported that women had worked in men's places on assembling. Over three-fifths stated that their output was equal or better than that of their male predecessors. Two-thirds of the firms reporting on 1919 labor conditions had retained their women assemblers.

GENERAL FACTORY WORK.

Other handwork done by women in and about metal-working factories did not differ in character from that done in factories working up other materials. Such occupations as fall under laboring, trucking, packing, weighing, cleaning, supervising, elevator operating, and electrical work will therefore be treated after discussing the more specific types of work on which women have been substituted on each material.

ELECTRICAL OCCUPATIONS.

Much of the work on which women were substituted in electrical supply manufacturing has been covered in the section on metal working occupations, for the material for which electrical apparatus is made is very largely metal. All electrical plants of any size have their own machine shops and tool rooms, where lathes, millers, grinders, slotters, and drills were operated by women to some extent during the war for the first time. In the sheet metal department women were substituted on punch presses and on soldering. In the wire department women took men's places as winders and braiders. As these occupations have been fully described in the foregoing pages, only such work as was peculiar to the electrical industry will be treated here.

Women had been employed on electrical work for some years before the World War. The 22 firms stating that 897 women were employed during the war on work which had been done by men previously used their services in occupations in which they had already been successful in other plants. Consequently the substitution brought about by war conditions did not open new fields for women in purely electrical work; it increased the number of plants availing themselves of women's services on these lines of work and also increased the size of the parts on which women were used.

The 22 firms substituting women for men during the war employed women on work in motor, dynamo, generator or transformer manufacture, or in processes in the making of switchboards, wiring supplies, batteries, and electrical instruments. The principal work taken over by women in these plants is described in the following paragraphs.

WINDING AND INSULATING.

Winding armature coils in form was done by hand. The wire as it is wound from a spool is tensioned by being clamped between blocks and then is wound about a shape by hand. After the requisite number of strands have been wound about the shape, they are hammered until they fit the shape perfectly. The girls cut the ends and remove and tie the shaped coils.

Coils of various kinds are insulated or "taped" or "wrapped" in several different ways. The largest coil covered by women—turbine coils—weighed 59 pounds and were placed on tables. Field coils, weighing 32 pounds, were held in supports at a convenient height. On these sizes, the girls wrapped mica strips or cloth tape or varnished cambric tape by hand. The wrapping must be done so that the ends and sides of the shaped coils will have the required thickness. In order that it may be even and tight, a great deal of hand pressure is necessary. Where the coils were held in supports the woman workers moved about them. Where they were held on tables the women had to turn them about in order to cover both sides. Smaller coils are insulated by machine. Sometimes the spool of tape is revolved electrically while the operator moves the coil, to which a tape end has been attached, in a manner that will give an even wrapping. On other machines the coils revolve while the operator holds and guides the tape about it. Insulating with plain tape is easier than insulating with varnished tape or mica strips, for the varnished tape is sticky

and makes the hands black, while the mica strips must be applied with sticker.

Winding magnet spools, transformer coils, and resistance coils consisted of running wire from reels through a press onto wooden revolving spools or paper shells or tubes. The operator guides the wire back and forth so that the spools are wound evenly. Fine wire must be guided carefully to insure smooth winding, whereas heavy wire falls into position almost of its own accord. On the other hand, the tension on the heavier wire is greater and the operator has to exert some muscular effort to control the winding. The winding of compensator coils is a more complicated process. The core is revolved on a stand by the left hand while the operator feeds tape around it. Corner pieces are put on and bound with varnished fiber and wound with wire. Copper strips are placed on the sides of the core and are soldered, while the entire core is covered with tape.

Women proved as successful as men on each type of winding and insulating and much better than boys. All work, except the lifting of heavy coils, was light. The only physical difficulty encountered was a callousing of the hands on hand wrapping with varnished fabric. The spools of wire for winding were brought to and taken from the woman operators by men.

ASSEMBLING AND CONNECTING ARMATURES.

The assembling of small armatures has been considered women's work in large electrical plants for a number of years. Medium sized work had also been done to some extent by them. After 1914 the numbers of women doing not only the small sizes but the medium sizes was increased. Armatures having narrowed slots and on which coils of solid metal were used were also turned over to women to do during the period of labor shortage.

The purposes for which the armature is to be used determines the method of assembly. Each armature core has a specification tag attached when it reaches the assembler and the work must be done accordingly. While there is considerable variation in the assembling, the following description will suffice to indicate the kind of processes involved. The armature cores are placed on blocks or turntables by men. The girls usually run a file over the sharp corners of the teeth of the armature core before they insulate the arc with paper strips. The end supports must also be insulated with tape. The coils are then inserted according to the specifications and hammered into place, and the insulation folded over the top of the coils. The leads are turned up radially for attachment to the commutator lugs. The commutator is brought to the table and set in place on the armature shaft by men. The leads are then bent down into the commutator lugs. The girls test with low-powered bulbs to make sure that the circuit has been completed, and if the windings are correct the joints are soldered. A layer of insulation is wrapped over lead windings and binding bands applied. In some small armatures, the girls also put binding bands around the coil.

This work requires deftness in the use of hand tools and some muscular strength. It is as skilled as any work turned over to women in the electrical shops. When the work is put into position

and shifted by men, or automatically, there can be no strain to the woman assembler.

TESTING.

Women replaced men to some extent in the testing of motors for resistance and excitation up to 500 volts, and in coil winding testing to a much higher voltage. While one girl holds the leads on the motor, another takes a reading, and a third makes the entry. Should any of the girls touch the ends after the connection has been made an accident would occur. There is small possibility of this happening, however, as the girl holding the leads needs both hands to grasp them in order to make the connections. The coil testers work alone. As they test for resistance and insulation up to 5,000 volts, the dangers of electrocution are ever present in this occupation. Girls had been employed at this work for two years and as yet no accident has occurred.

MICA WORK.

Women have been employed in the mica departments of electrical establishments for many years. A few firms, however, turned some of their work in this division over to women during the war. Large presses were then operated by women to cut mica insulation into different shapes. The punch was brought into position by pressure on a trip as in metal punching work. Hand screw machines were also used. The fiber strip is fed into the machine automatically. The operator heats it in a gas flame while she brings the sliding turret, holding the shaping tools into position. After the fiber is turned, the turret is removed and a cutting tool cuts the strips to proper length. This machine is like the turret lathe, except that the tools shape the heated material by molding rather than by cutting.

In one plant women removed the excess compound from the spools with an oil-dipped cloth and a knife. The work was very dirty, but involved neither skill nor strain.

MISCELLANEOUS ELECTRICAL WORK.

Sockets, buttons, keys, plates, and plugs that are made out of a gum and shellac compound were molded into shape on hot hydraulic presses by girls. While the work varied with the object to be shaped, generally speaking, the operations are as follows: At the side of the operator is an electrically heated plate on which slabs of the compound are kept at the proper temperature. The girl screws the parts of her mold together and puts some of the compound in it. The mold is put on a hot-press bed and the ram brought into position and removed by turning a hand screw. The heated mold is removed with a cloth and the object taken out. This work is neither difficult nor dangerous, but the heat near these hot presses is often excessive.

Girls were first employed on lead making in one of the establishments during the war. The leads are made by cutting wires to length and pressing metal ends on them. The ends are then soldered.

Much of the light bench work was turned over to women. Like other assembling, this involved drilling holes, screwing parts to-

gether, and painting ends by hand. In one establishment flashlight cases were made by women. The tin bottoms were put into the cans and soldered. The paper tubing was made and joined to the metal ends. Inspection of varied small parts was also a part of the work on which women were substituted.

Only two electrical firms expressed general dissatisfaction with women's work. One firm stated that woman machine workers were "less reliable and more inclined to floating than men and the discipline in the departments where men and women worked suffered considerably." Another firm that used 114 women on assembly and inspection said that their output was 10 to 15 per cent lower than men's. All the other 18 establishments in which the work of men and women was comparable reported that woman's work had proved a decided success.

WOODWORKING OCCUPATIONS.

The number of lumber and lumber reworking establishments which attempted the employment of women during the war on work that had never been considered within a woman's capacity gives undue importance to the matter of substitution in woodworking occupations. For although many firms were forced by acute male labor shortage in their respective districts to make ventures in woman employment, the numbers of women actually employed per firm were less than in the other man-dominated industries. The 152 lumber firms reporting on the occupations in which women were substituted for men employed, during the war, on an average but 17 women in these positions, whereas the smallest average number substituted in other industries (electrical occupations) was 41 women.[8] This situation was due in a small degree to the fact that little expansion in labor forces was necessary between 1914 and 1918 in the lumber industry as a whole, and only such plants as were essential to the war were later given any place on the preference lists for fuel, material, or labor. But more largely was the limited substitution due to the character of the work to be done and the conditions under which the trees were felled and manufactured into finished lumber. That "the logging camp is no place for women" seems to have been the opinion of men who tried to turn over some of the work in camp to women. A northwestern sawmill manager states: "Women were enthusiastic at first but when the novelty wore off and the weather got bad they were ready to quit. None have applied for work since." "We found they (women) could not stand the work of handling lumber, so replaced them at the earliest opportunity," said one manager of a southern sawmill. A planing-mill operator seems to voice the opinion of other men who attempted substitution in planing mills: "We do not think women should be or can be successfully employed in lumber manufacture." Many women employed in these three branches of the lumber industry seem to have shared the opinions of their employers with regard to the work they had done for they left these jobs either before or as soon as the armistice was signed. Table 32 shows the extent and success of substitutions of women in various branches of the lumber industry.

[8] Table 29, p. 94.

GLUING ROOM, WOODWORKING ESTABLISHMENT.

TABLE 32.—EXTENT AND SUCCESS OF SUBSTITUTION OF WOMEN FOR MEN DURING AND AFTER THE WAR EITHER THROUGH DIRECT REPLACEMENT OR THROUGH EXPANSION IN ESTABLISHMENTS ENGAGED IN THE MANUFACTURE AND REMANUFACTURE OF LUMBRE.

Branch of industry.	Firms.		Total women substituted.	Firms reporting women's work.		
	Substituting women.	Reporting number of women substituted.		As satisfactory or better than men's.	Not as satisfactory as men's.	Not comparable.
Furniture manufacture	[1] 35	34	686	22	7	6
Veneer manufacture	17	16	457	12	3	2
Logging camps, saw mills, and planing mills	41	37	269	18	11	9
Woodwork on airplanes and seaplanes	[1] 7	6	268	6	1	.....
Box making and cooperage	14	14	213	11	2	1
Shingle, stave, barrel heading, and other mill by-products	16	16	197	6	8	2
Work on sashes, doors, and other builders' material	10	10	121	5	4	1
Woodwork on musical instruments	4	4	113	4	.....	.....
Miscellaneous woodwork	10	10	221	7	3	.....
Total	[1] 152	[1] 145	2,545	91	42	[1] 19

[1] Two firms making furniture also manufactured airplane parts and neither reported on the success of women's work.

When smaller lumber was to be handled and the work could be done under factory conditions the number of women substituted during the war was greater, and some of them were retained after the armistice was signed. But even in these lumber remanufacturing factories the largest numbers of women were employed in positions requiring little training or skill—positions that had been held by boys or young men. A few, however, were employed on each of the more important woodworking processes. While these were few in number their work was indicative of what women can or can not do in emergencies. A short description of the numerous occupations in which women were substituted for men follows. Laboring work in lumber yards and mills is considered, however, with laboring work in all other industries.

MACHINE WORK.

Unlike metal-working machines, many woodworking machines require not only an operator, but a person to stand at the back of the machine to remove the finished stock. The latter person is called an "off-bearer." He must keep the rear of the machine clear of stock and pile it on trucks to be taken away. Sometimes he does the trucking. On certain work he also acts as "examiner," inspecting each piece as it comes out of this machine. Twenty-six firms employed women in men's positions as off-bearers during the war. The 22 reporting on numbers substituted approximately 350 women. These worked in planing mills removing boards from the cutting machines. They took staves and shooks away from machines, removed veneer from heated rollers, and carried newel posts, door panels, and chest parts away from machines. In furniture factories they worked back of saws, planers, and sanders. In 19 factories their work was considered equal to men's, in 7 factories less than men's had been. The lessened output was due in part to the fact

that men holding these positions did their own trucking, whereas the woman workers merely kept the machines clear of stock. Seventeen firms had retained women in off-bearing positions in the summer of 1919.

Women were substituted as operators of circular saws, band saws, jointers, planers, boring machines, mortisers, and sanders. The women employed on each type of machine were few. Seven firms used their services as saw operators, but of these only five reported on the numbers employed—totaling 15. The circular saws—disks of steel with saw teeth on their circumferences—were of the ripsaw and crosscut saw type, the ripsaw having its teeth ground to cut with the wood grain, and the crosscut saw cutting across the grain. The first-mentioned machine was used to cut parts for furniture to the proper width and to saw wedges. The operators, ascertaining the width to which the stock was to be cut, clamped a guiding fence at the given distance from the saw. The saw was raised to the proper height and the power turned on. As the saw revolved the operator fed the stock to the machine by hand. When the ripsaw was used, the stock was held against the gauge fence by the operator while the table moved backward and forward carrying the stock against the revolving saw. The band saw was operated by women on furniture and to cut holes on ribs for airplane wings and in making templates. It is an endless band of steel, with saw teeth on one edge, which passes over and is driven by wheels. The stock had the shape of the desired cut marked upon it. The operator presses the wood against the saw, turning it so that the saw follows the outline as marked. Although four of the seven firms reporting on occupational substitution declared women's work to be as satisfactory as men's, only one firm retained their services after the signing of the armistice.

Wood-planing machines were operated by 25 women in four establishments. These machines reduce the stock to the proper thickness. The machine table was first raised to secure a given cut. The stock is then pushed into the machine where rollers carried it to cylindrical revolving knives and other rollers threw it out of the machine. Jointers were operated to make the bilge in staves and true their surfaces. The stock was pulled over the revolving cutters by hand, the operator having to exert uniform pressure on the cut end of the board in order that the entire surface would be cut in the same plane. Slots were cut to receive the ends of other pieces of wood on mortisers. The stock was rested against the guiding fence and rolled against the mortising tool for successive cuttings by means of a handwheel. Boring tools were fed into wood parts to make holes either by turning a handwheel or by pressure on a foot lever. The firm employing women on the latter type machine stated that they were unable to operate the machine as continuously as necessary to keep up with the steady flow of work.

Undoubtedly more women were substituted in sanding machines than on any other wood-working machine. The exact number employed can not be ascertained, however, as many firms failed to specify whether the work done was hand or machine sanding. The drum sander used required only to be fed as the feeding rolls carried the work over revolving sandpaper-covered drums. On the belt

sander, the women had to press a sanded revolving belt against the stock, a hand block being used for this purpose.

Other machines were operated or fed by a smaller number of women than operated the machines described above. Some of these, like the "hog machine," were operated automatically, the women merely watching to see that the material was fed in evenly and that nothing choked the machine. Others, like the dovetailing and sticker machines, were similar in operation to the knife and saw-cutting machines described above. The lathe machines used in turning stock were similar in mode of operation to the metal-turning lathes.

While among the woodworking machines operated by women were some of the most dangerous—the circular saw and the jointer—the safety orders issued by the accident commissions in the several States in which they were employed undoubtedly afforded them protection. These orders state that all circular saws and exposed cutting knives must be guarded with hoods, and devices must be installed to prevent or lessen the possibility of stock being kicked out of the machine onto the operator. The modern woodworking machine is also equipped with exhausts to carry sawdust and chips out of the machine as fast as they are made. Although agents did not report on the extent to which woodworking machines were guarded, they spoke of the freedom from dust in some factory rooms in which the women worked, but also of the dust-laden atmosphere and shavings-covered floors in the factories where exhausts were inadequate.

Although not important from the viewpoint of numbers, it is interesting to note that some women were employed in sawmills to control the movements of logs as they passed over the timber deck down the incline leading to the sawyers. The work involved the pressing of buttons or moving of hand levers which controlled rolls or chains. While not hard the operator had to be alert and very careful. In a logging camp the women acted as "signalmen" in the woods. The engineers operating the log-moving machinery were stationed at some distance from the man in charge of log moving. It was necessary, therefore, to have women signal the orders of the latter to the former. "Signalwomen" and "lever-control women" were reported to have rendered very good service, but they did not remain at their work when men could be obtained for their positions.

HANDWORK.

As in other lines of manufacture, so in lumber, the exact number of women employed in the different occupations is not obtainable either because many were shifted from one kind of work to another or because some factories kept no record of employees by occupation. However, in the woodworking factories reporting on the number of women substituted in each occupation, 1,071 women were doing some kind of handwork other than laboring work as against 795 machine operators or helpers.

The handwork performed varied with the product manufactured.

Sorting and matching was done in planing mills, veneer mills, and builders' material mills by 95 women. They sorted boards according to the grades which had been marked upon them by men or women graders. Miscellaneous saw-mill stock was picked over, as it passed

down conveyors, to determine for what product it could best be used. In veneer factories, the sorters not only examined the cut pieces, but piled it up like reams of paper. Barrel factories employed women to match staves, floor-making mills to match flooring. Much of the material had to be gotten ready for shipment. Eighty-two women piled staves, shingles, molding, and floorings on presses or in racks in required quantities or tied these bundles with cord. These workers were called bundlers or tiers.

Assembling work was done during the war by 446 women. This consisted very largely in fitting parts together and gluing or nailing them into position. In box factories, women carefully laid glue over the tenons and other surfaces and fitted each end together. In barrel factories pieces of wood were glued up to make stock wide enough to be cut into barrel heads. Over 110 women laid veneer by hand on airplane parts and tool boxes after they had covered the surface with glue. They were considered a "great success" at this work, which is light but requires care in matching and placing the veneering. In airplane factories women worked on ribs, gluing the web into a slot cut in the flanges and binding the flange and web more firmly together by winding linen thread around them. Furniture factories employed only 68 women in men's places as assemblers, more than half this number assembling small cabinets, the others acting as cabinetmakers' assistants. Only one woman was reported to have reached the position of cabinetmaker—or all around furniture assembler. Sound boxes were assembled by women in phonograph factories.

Finishing ranks next to assembling in the numbers of women employed in it during the war for the first time. Unlike assembling, it was done entirely in furniture factories, airplane and musical instrument factories. There are a number of processes involved in finishing highly polished woods. Women were employed on all of them, sometimes specializing in one operation, sometimes learning each branch of finishing work. The first process on which women were substituted involved rubbing the stain into the wood and then working in a filler to close the pores. After this the piece was sanded by hand or machine, the machine sanders outnumbering the hand sanders. One hundred and twenty-five women applied coats of varnish to the smoothed parts, being careful to apply just the proper amount. The final water and oil rubbing and polishing was done by but 19 women. With the exception of hand sanding, women are reported to have made a success of finishing. In hand-sanding five out of seven firms state that women's output was very much less than that of their men predecessors.

Before furniture can be shipped it must be wrapped with excelsior pads or in burlap. Sixty-seven women did this work during the war. Chairs were the principal article wrapped. They proved successful in this work in five out of six plants. In the sixth plant it was stated that the women did not draw the strings tightly enough and had therefore to be dismissed.

Among the more interesting handwork done by women was the marking of patterns on wood for the band sawyers. The women had to use discrimination in picking the lumber for each piece of work. The pattern must then be laid on the wood so that imperfections in the wood were avoided and also so that the piece of wood was cut to

the best advantage. The pattern was then outlined on the wood. This work was performed by 41 women.

Painting was done in three factories on work in which men had been employed before 1914. Some women painted pails, others painted wagons and wheels. Camouflage painting was reported as having been done by women in one factory.

Although the signing of the armistice and consequent canceling of orders for airplane parts, ammunition boxes, and other war products lessened the numbers of handworkers needed in veneer mills, the service rendered as veneer layers, sorters and packers, and kiln hands by women was so satisfactory that they have been retained in 12 out of 31 factories. One veneer manufacturer states: "We are keeping women from the fact that they do their work nicer, and while it takes more of them to do it, it is a little more satisfactory." Other factories shared this opinion or considered women's work as good in quantity as men's work had been.

In furniture factories women were retained as finishers in 14 out of 18 plants, as packers in 5 out of 6 plants, as pattern markers in 2 out of 3 plants, as assemblers in 3 plants. The three musical instrument factories substituting women as wood assemblers and finishers were continuing the employment of women in the summer of 1919. As sorters, bundlers and tiers of staves, lathe and millwork workers, women were dismissed in 8 out of 13 factories reporting on the subject. Although they seem to have made good in these special capacities, these women could not also be used successfully about the mills and yards for miscellaneous laboring work which men sorters, bundlers, and tiers had been called upon to do. Their services were therefore discontinued as soon as men could be gotten to replace them.

CHEMICAL OCCUPATIONS.

Outside the field of explosive manufacture little substitution of women occurred in operations peculiar to chemical industries. While 5,151 women were substituted in processes connected with the manufacture and loading of explosives, in the manufacture of fertilizers, illuminating and heating gas, baking powders, soap, drug preparations, oils, paints and varnishes, carbon and polishing preparations, chemicals, acids, dyestuffs, extracts, and the refining of petroleum, 45 firms reported a substitution of but 1,784 women. Of this number, 473 were engaged in strictly chemical occupations, 838 were laborers, 24 cleaners, 62 were engaged in sewing operations, 9 as truck and auto drivers, 189 in the packing, wrapping, and shipping of goods, and 189 in miscellaneous occupations not directly related to the chemical industry. Even among the 473 women first named, but a few were employed at the same process. For this reason only such occupations as are characteristic of the kind of chemical work done outside of explosive manufacture will be described. Table 33 presents the figures on women's substitution in the manufacture of chemicals.

TABLE 33.—EXTENT AND SUCCESS OF SUBSTITUTION OF WOMEN FOR MEN DURING AND AFTER THE WAR EITHER THROUGH DIRECT REPLACEMENT OR THROUGH EXPANSION IN CHEMICAL ESTABLISHMENTS.

Branch of industry.	Firms.		Total women substituted.	Firms reporting women's work.	
	Substituting women.	Reporting number of women substituted.		As satisfactory or better than men's.	Not as satisfactory as men's.
Explosives	9	5	5,151	9	
Petroleum refining	6	6	545	4	
Gas, illuminating and heating	6	5	356	2	
Chemicals, acids, dyestuffs, and extracts	7	7	273	1	
Grease, tallow, soap, candles, and glue	4	4	204	4	
Paints and varnishes	8	7	164	3	
Fertilizers	3	3	94	1	2
Oils from plant, fish, and animal life	5	5	61	1	3
Druggists' preparations and patent medicines	6	5	31	4	1
Carbon and polishing preparations	3	2	31	2	
Baking powder and yeast	1	1	25	1	
Total	[1] 58	50	6,935	[2] 32	16

[1] Exclusive of four chemical establishments employing women on metal work only.
[2] Ten firms did not compare the work of men and women.

The situation in plants manufacturing and loading explosives, however, was quite different. Here many women were employed at similar tasks. In some plants these women had replaced men or were employed on the same work as men; in other plants doing similar work women were employed on these processes from the date the plant engaged in this work. This was particularly true in the loading of explosives. Here 9,716 women were engaged to do this work in plants in which the work was new. While these workers cannot be considered as substitutes for men, yet the work which they did was so important to the winning of the war as to merit description in this chapter.

EXPLOSIVE MANUFACTURING.

The explosive produced in greatest quantity by the United States during the war was smokeless powder, a propellant powder, the explosion of which drives the projectiles from the gun. Nine plants substituted 4,854 women on various operations involved in the manufacture of smokeless powder.

By far the largest substitutions were in the operating of presses and cutting machines and in sorting. One plant that substituted 1,063 women reported the distribution of their occupations as follows:

Temperature readers	50
Sorters	250
Cutting-machine operators	537
Press operators	100
Ether weighers	24
Forewomen	12
Commissary	50
Laundry	20
Bag repairing	10
Moisture testers	10

WOMEN OPERATORS IN A GOVERNMENT ARSENAL LOADING PLANT.

Another powder plant reported that women were satisfactorily employed in the laboratory. Three expert women chemists were put in charge of 30 to 40 high-school girls who were used as routine analysts.

A description of the work done by the women in the first-mentioned plant follows: The powder comes to the finishing-house presses in the form of cylindrical blocks about 10 inches in diameter and 15 inches long. Each press has a screen against which the block is placed. The block is forced through the screen and out of the end through die heads in circular macaroni-like strips about an eighth of an inch thick. The powder strips fall from the press into buckets.

The press operator sets up the empty buckets on the press table, cleans out the dies through which the powder is pressed, and changes the dies when clogged. She operates the press and regulates the speed by simple levers. The operator must prevent clogging, regulate the speed so that the powder runs smoothly, and see that the buckets revolve properly, adjusting any belt which slips. She must also keep watch of the powder as it runs to be sure that the pins in the dies are not badly off center.

The cutting-machine operators carry the buckets of pressed powder from the press table to the cutting table, feeding the free ends of the powder into the machine. The operator starts and stops the machine by a simple lever and regulates its speed by the same lever. The operator removes the tangles in the strings and keeps them fed into the machine as they break off, watches the buckets into which the cut powder runs, and removes them when filled, placing empty buckets under the outlet. The machine is fed by hand through perforations in a plate. The entire work of cutting is carried on within the machine. The operator is responsible for getting her powder cut as quickly as possible so that it will not dry, for watching the machine to see that it does not heat, for removing filled buckets, and for watching a sample of the powder to see that it is properly cut.

The cut powder is fed from a hopper onto a moving belt which runs down the center of the tables at which the sorters are seated. The women pick out by hand the defective pieces of powder, allowing the good powder to run on down the belt into the bag at the end of the table.

The temperature in the various drying rooms must be kept constant. Temperature readers record the temperature of the powder in every car every hour. They regulate this temperature and keep it at a certain level by adjusting the valves on steam pipes and on cold-brine pipes. Each operator usually has a number of cars under her care and goes from house to house looking after them.

Moisture testing is laboratory work, and is done in a specially equipped office. The tester weighs out certain amounts of samples of nitrated cotton, which are placed in a miniature press. After a time the samples are removed and again weighed, the loss of moisture being computed by the loss in weight. This operation requires fine, careful work.

LOADING EXPLOSIVES.

Separate plants were maintained for the loading of bags with powder, and shells with powder and high explosives.

When the metal parts of the shell are completed and assembled the shell is sent to the loading plant, where it receives its high-explosive charge, and is fitted into a case filled with the proper amount of propellant powder. Much of the lighter work connected with the charging of the shell with a high explosive was done by women, the work varying somewhat with the plants reporting. Two shell-loading plants reported that 255 women were employed by them.

The shell arrives at the loading plant with a wooden or metal shipping plug screwed in its nose. This plug is removed by a simple machine operation. The operator lifts the shell, holding the plug against a revolving shaft set with steel points which grasp the plug and unscrew it. Except with the very heavy shells, women do this work easily.

To assist in the handling of the shells in the various processes, large plants were equipped with conveyor belts running at a convenient height, from which each shell was removed and upon which it was placed after the operation had been concluded.

After the plug has been removed the empty shell is washed in a tank of hot water and caustic soda to remove any grease or grit that might have gathered. Women did some of this work.

The interior of the shell is then painted, and the next operation performed by women is the weighing of the empty shell on a small platform scale and chalking its weight upon the side.

The shell is now ready for filling with the high explosive. In all cases the pouring and pressing of the high explosive was done by men. When the main explosive charge has sufficiently cooled, a cavity is drilled into the charge into which the steel jacket holding the booster or detonating charge will be fitted. Women carefully clean the threads of the shell to remove any grains of explosive that may have collected. The next operation which girls perform is the measuring of the booster cavity with a gauge to determine whether it has been accurately drilled and is the correct size.

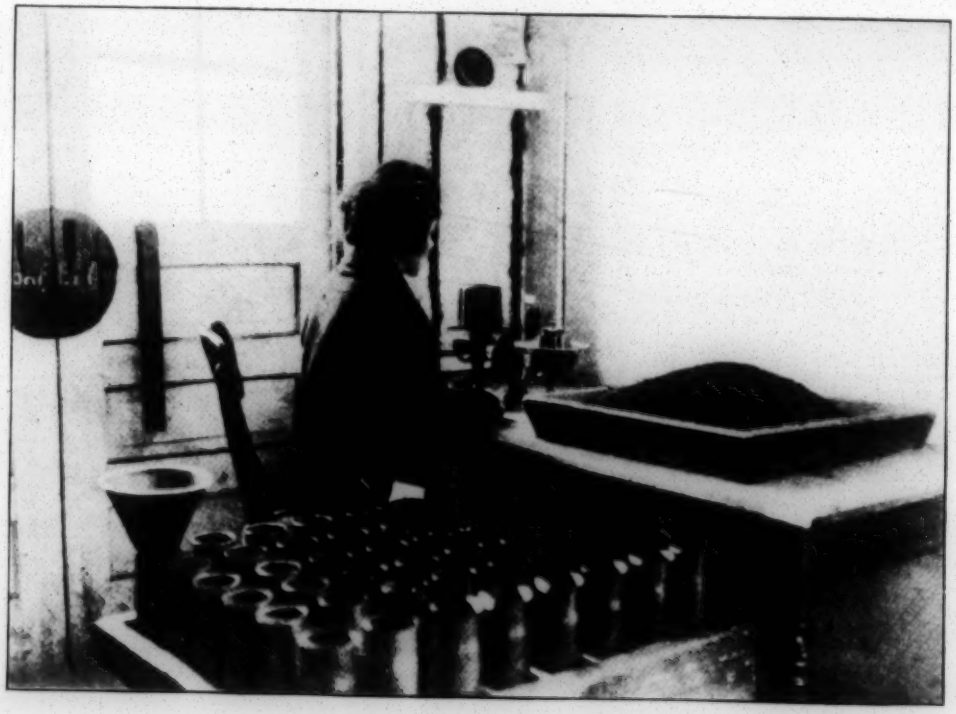
The booster cavity is shellacked, and the projectile is complete except for the insertion of the booster and fuse, which usually were packed separately and not inserted until the shells arrived abroad.

The cartridge case into which the projectile is to be inserted is loaded with smokeless powder. In this process women performed the following operations:

The mouth of the case is first polished. The case is held and turned by a lathe chuck. The operator holds an emery cloth within the mouth of the revolving case, in this way polishing the inside of the case for several inches. The surface is then wiped clean, and the case removed from the chuck.

The stamping of the number by a hand press and the applying of paint to a groove in the case to identify the character of the shell are simple operations

The cartridge cases are shipped to the loading room, where they are filled with smokeless powder. This is a most important and precise operation, involving great care and accuracy. The powder is weighed on carefully adjusted automatic scales, and the measured charge



LOADING SMOKELESS POWDER.

From report of Benedict Crowell: America's Munitions, 1917-1918.

poured through a funnel into the cartridge case. This work was in all cases done entirely by women.

The projectiles are placed in the loaded cases by men, and the edges of every case crimped to hold the projectile securely.

Women are also employed in the packing house, where the finished shells are placed in cans, and the cans packed in fiber containers.

Shells destined for guns larger than 4.7-inch are not supplied with a fixed amount of propellant powder in cartridge cases, but are fired from the guns by the explosion of powder which has been loaded into silken bags, the number of bags placed in the breach of the gun behind a projectile depending upon the size of the shell and the distance it is to be sent.

Four bag-loading plants which closed at the time of the armistice employed 9,716 women, weighing powder, filling bags, stitching the ends of the bags by power sewing machines, and operating putteeing machines.

The largest of these plants employed 6,500 workers, 5,200 of whom were women. From this establishment most enthusiastic reports were received of the efficient and patriotic service rendered by women in this most important and hazardous work.

As in the shell-loading plants, women weighed the powder on automatic or hand scales. It was then distributed to different rooms, where bags of raw silk with ends made double ply were filled by other women with the powder which had been weighed out. The openings in the bags were sewed on machines. The bags were then assembled and were wrapped together, one bag directly on top of the other. This wrapping or putteeing was done by hand or by machine. The putteeing of the larger charges was done entirely by machine.

Concerning the work done by women in the bag-loading plants, the Assistant Secretary of War said:[9]

> Filling the bags is a precise and delicate operation. Chances can not be taken or averages struck. Errors may mean the possible loss of battles. A battery commander who has figured his range and who is about to drop a number of high-explosive shell on an enemy battery must know exactly how much powder he has behind his charge. If more powder is in the bag than he calculates on, he will overshoot his mark; if less, the shell, instead of dropping upon an enemy battery, may explode in the midst of his own advancing troops.

Fuses were usually loaded at separate plants and then shipped to the shell assembly points to be packed and sent overseas with the projectiles for which they were intended.

One firm reported the employment of 215 women loading fuses. The women disassembled the metal parts which were shipped into the plant. This was done by hand or on a friction machine. The disassembled parts were then set in perforated wooden blocks. The parts to be loaded were sent down a conveyor past the loading operators.

In one type of fuse loading the operations are very simple and done by hand. They consist simply in placing detonators, inserting washers, painting socket threads, and screwing on sockets. The next operations performed by women on this type of fuse is the wrapping of the fuse by tape. This is done by hand or on a machine. The cap is then crimped on the neck of the fuse by a Battle crimping machine. The operator simply places the fuse in the position and removes it.

[9] America's Munitions, 1917-18, Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, 1919, p. 113.

In other types of fuses the parts, except the relay cups receiving charges of black powder, were loaded by the pellet method. Black powder is first made into pellets by a pelleting machine. These pellets are placed by hand in the parts to be loaded; the parts are set up in trays and the pellets compressed to the proper density by a press.

The relay cups are loaded with loose powder. The cups are set up in frames of six. The powder is deposited by a charging machine and compressed by a pressing machine. The parts are taken to the subassembly room and are fitted together by simple hand work. The completed fuse is assembled by bringing together the loaded components, the other metal parts from the disassembly room and the detonators.

The work of fuse loading was light and simple; the machines used were easily operated; the work done by the women required no strength, but a good deal of skill and dexterity.

One firm reported that 50 women "did good work" in the loading of small cartridges. The propellant powder and bullet are placed in the cartridge case and the case crimped to hold the bullet in place. This is done by the operation of a machine fitted with dials, loading containers and punches. The empty cartridge cases are placed upon a dial which automatically carries them to a ratchet dial, which, with the aid of a spring punch, places them in position. The dial is indexed from one position to another until the loading process is completed. The first operation is loading the case with powder. This is held in a large funnel. A slide operated by a crank motion allows the correct amount of powder to be placed in each case. As the case is moved to its next position a small punch drops, packing the powder. Another powder charge is then added. The cases are next transferred to a position under a dial loaded with bullets held points up. The bullets are placed in the cartridge cases by means of a punch operated from a camshaft under the machine. The next operation crimps the top edge of the case, in order that the bullet may be securely held, and the loaded cartridge is then ejected from the machine.

MISCELLANEOUS CHEMICAL OCCUPATIONS.

The following description of some of the work with chemicals on which women were substituted indicates the general character of the work on which they were employed during the war in chemical plants manufacturing products other than explosives.

A plant engaged in the manufacture of glue and fertilizer substituted 10 women grinding bone and 10 more in the handling of glue nets. The grinding operation entailed the constant shoveling of bone into a mill where it was drawn under stones by collectors and when sufficiently ground automatically discharged. The handling of the glue nets required care and strength, but no special skill. Cakes of solidified glue were taken to the drying room and placed upon nets, which are stretched upon frames from 6½ to 8 feet long and between 3 and 4 feet wide, and which are set one over the other upon supports about a foot apart. The cakes must be carefully watched and turned two or three times a day in the drying process, the frames sliding out like a drawer for this purpose. The nets must be shifted about from time to time to allow the glue to dry

evenly. Both the grinding and net handling were found to be too heavy for the women and they were dismissed.

The substitution by a gas light company of 226 women as lamp trimmers, meter readers, and repairers, stove adjusters, collectors, assistant chemists, candlepower testers, and valve regulators resulted most satisfactorily, and their employment in these capacities will continue at the wages formerly received by men workers. As lamp trimmers, meter readers, and repairers, the women were slightly less satisfactory than men. In the other operations they were equally efficient.

Another company used 14 women in gas lamp maintenance. The work consisted of systematic visiting of stores and residences to clean, adjust, and repair gas lamps. This firm found that women were less efficient, that they did less work and used more material, increasing the cost of the lamp. Only two women have been retained. Their rate of pay is 83 per cent of that given men engaged in the same occupations.

A soap manufacturer reported 20 women substituted for men in the operation of automatic machines cutting slabs of soap into cakes. The slabs were placed on racks on a table-like machine with interchangeable steel cutting heads and pushers, which automatically cut the slabs, separate and spread the cakes upon the rack, eject the finished rack from the machine and return to position for the next frame. The women performed their work satisfactorily, although their output was only 75 per cent that of the men, and their rate of pay was fixed at the same proportion. Women have not been retained, because the plant is not equipped for the employment of both men and women.

Girls were substituted for boys in the feeding of automatic soap stamping and wrapping machines at the same rate of pay by a manufacturer who found his 60 substitutes less efficient than boys, but retained them because he was unable to secure boys, while another plant which substituted 107 girls at a 40 per cent higher rate on automatic wrapping and packing machines reported equal output, greater reliability, and higher standards of work.

In the manufacture of cream of tartar and tartaric acid, 15 women were substituted on centrifugal machine dryers and two as press operators. Where one man formerly operated one centrifugal machine, now one man and one woman operate two, the man filling the machines, the woman washing and emptying. Much better results were secured by this arrangement, and women are to become a permanent part of the factory organization. The women tend the centrifugals better than the men did, and the output has increased. The two women who were put on presses have done so well that more are to be employed. Their output has been equal, and the superintendent finds them more reliable. Notwithstanding the success of these substitutions, the women in this plant receive a rate of pay approximately 10 per cent lower than the men.

Reports from cotton oil mills indicate that work in these establishments is too heavy for women, the five firms concerned having all dismissed their woman workers, chiefly colored women, with the exception of one mill which employed seven colored women crushing seed. This employment is to be continued as the women did satisfactory work, although it was necessary to substitute two women

for one man. The operation consists of feeding seeds into the iron hopper of a hydraulic crusher equipped with belt-driven steel and iron rolls. The feed is started and stopped by means of a lever clutch on the feed roll shaft.

Two plants manufacturing paint and varnish used women as can fillers. One superintendent who substituted 16 women estimated their output to be only 65 per cent of that of the men. They were unable to gauge the filling as accurately, and although employed only on the lighter cans, it was necessary to give them the assistance of two men to lift and carry. The women are now paid 25 per cent less than the men receive, but the superintendent stated that their rate would be raised if they became more expert.

Another manufacturer decided that women were not equal to this work and abandoned the experiment, although his record of production shows the relative output of women to have been 84 per cent.

One woman was substituted as a mill operator, crushing, mixing, and grinding pigment which had been mixed with oil. Her employer reports that her work was satisfactory and her output equal to the output of men on the same operation, but adds that it is so difficult to get women capable of doing this work that he will not employ them further.

In petroleum refining, six firms substituted 545 women, 369 of whom were laborers. All but 50 of these laborers have been dismissed, as the work was found to be heavy and unsuitable for women.

In one refinery 25 women were substituted as testers in the laboratory. These women were not chemists, but were trained to do simple routine work, such as testing for specific gravity by means of the hydrometer. The girls have given thorough satisfaction, and their employment will be continued.

Five women geologists were taken on in the places of men by another oil producing company. Their work consisted in making geological contour maps of the producing fields and in general correlation work by means of well records. They are also conducting special investigations. Three women geologists are still employed bythis firm, which has found their work most satisfactory. However, the women have been employed only in indoor work, as outdoor work, the manager states, is not suitable for them.

Another interesting and permanent substitution by oil companies is that of 52 woman service station operators, who are giving service equal to that rendered by men displaced and receiving the same wages.

Ten women were substituted as wax weighers in a chemical plant, manufacturing blacking. Their rate and output were 75 per cent of that of the men displaced, and although their work was satisfactory as a whole, they were less efficient than the men. After the emergency passed these girls were put back on their old work. The same factory is retaining in their positions four girls promoted to be forewomen over the women inspectors. Their work has been most satisfactory.

RUBBER-WORKING OCCUPATIONS.

The great increase in the employment of women in rubber-working occupations between 1914 and 1919 was occasioned by the making of gas masks, a product the manufacture of which was begun during the war and ended to a large extent after the signing of the armistice. Although men were employed in rubber factories to make the masks during the experimental period, when the work was put on a factory production basis, it became a woman's industry. The more than 10,000 women employed in making gas masks are not therefore included among the women substituted for men in the rubber industry.

The largest number of women taking men's places in rubber factories were employed in different tire-making processes. In some factories women had been employed in these occupations before the war; in others the work was undertaken by women after 1917 for the first time. Seven rubber-tire factories reported the work on which women replaced men. Six specified the numbers so employed, reporting 1,294 women. The seventh factory placed approximately 3,000 women on tire work and other rubber work that had been done by men prior to 1917, but this firm did not specify the number used on each type of work.

Tires are made in different ways by different factories. A brief description only, therefore, of the fundamental processes involved in each occupation in which women replaced men will be given. Sheets of rubber-coated fabric were cut into strips by machines operated by women in three factories. These strips were built up to the desired thickness for tire builders by another group of women. This was done by stretching strips over a drum or a table, and after cement had been applied, by folding other strips over them until the correct number of layers were cemented together. Other women took men's places in making inner tubes for tires. These women placed sheets of rubber over hollow pipes and cemented the edges together. An aperture for the valve had also to be cut in the rubber. Sizes and names were stamped on these tubes in another section of the factory, and when the tubes were complete women boxed them for shipment.

Beads or the parts of the outer shoe of the tire which fit into the rim grooves were wrapped and trimmed by women, while others cut and trimmed the tread, or the top piece of rubber in the shoe which comes in contact with the road. After the tires had been built up by men the smaller sizes were finished and inspected by women. As these tires are built upon an iron core shaped like the inside of the completed tire and weigh from 14 pounds up, it was necessary for firms to employ men to place the tire on the finishers' wheel or to install lifting jacks to take the tire from the truck to the wheel. The finishers adjust the tire on the wheel and apply to it several layers of fabric and gum. After each layer is applied the finisher holds a roller against it to make it adhere while she spins the wheel about. The rough edges are then cut off with a knife. The inspectors placed the tires on spools with the aid of lifting devices in two factories, but in a third factory they had to do their own lifting. They examined the tire for flaws as they revolved it about the spool and then threw it aside. As the tires are constantly being lifted on

and off the spools, the work involves much strain where lifting jacks or other devices were not used. For special makes of tires wire coils were taped and cords were cut. Women also prepared patches for repair kits and aided in tire repairing. Finally they weighed and boxed the finished tire. Women had not been dismissed from any tire-making occupation in the summer of 1919; however, two firms that employed them as finishers and inspectors, with and without the assistance of men lifters, stated that as these women dropped out they would be replaced by men, as the lifting was too severe for them and it was too expensive to employ men in the capacity of lifters. The success of women tire makers is said to be due "to their deftness, quickness, and neatness."

Relatively few women were substituted for men in other departments of rubber factories. In one large plant, women replaced men at the machine which washed rubber and which refined and strained reclaimed rubber. Other women pulled apart sheets which were stuck together when they came from the rollers and sprinkled whiting between them. Six women were substituted for men in bootmaking in one plant. They worked as a team, spreading cement on the rubber edges of boot parts and applying these parts to the cloth linings fitted on wooden lasts. The cemented boot was rolled even by means of a hand roller. In another factory rubber dough stamped into sizes to fit heel molds was put into molds in a hot hydraulic press by women. When the heels were thoroughly baked, the press was opened and the hot heels removed. Women wore gloves while tending this press in order to avoid hand burns.

The only other occupations in which women were reported to have replaced men was in cutting and splicing fabric for balloons.

Wherever the work on which women were substituted during the war in the 11 rubber factories reporting continued during 1919, the services of women were retained.

LEATHER-WORKING OCCUPATIONS.

Fifteen hundred and forty-five women were engaged to fill places left vacant by men during the war in 20 leather-working establishments. Of this number, 442 were substituted in tanneries, 1,043 in shoe factories, and the others in harness, belting, and miscellaneous leather-goods manufactures. Those employed in tanneries gave satisfactory service and they were being retained in 1919. In shoe factories, however, even though some of the new work done by women was considered equal to the work which men had done, all but 210 of the positions in which women were substituted were filled by men as soon as men were available. The women who had occupied these positions left voluntarily or were transferred to the fitting and stitching departments where the working force had always been composed of women. One shoe firm which retained about a third of the women substituted makes this statement concerning the results of their employment during war time:

> Women carried us through the labor shortage, but are not a permanent proposition, excepting on the operations mentioned above.[10] The use of women had not previously been made (in these operations) merely because the departments had always been 100 per cent men, and the introduction of one or two girls into a room of 100 to 150 men

[10] Sorting, inspecting, tending machines, and other minor operations.

would have had an undesirable effect upon the discipline of the room. During the last two years, however, this prejudice has been broken down, and we are able to use a few girls in a large department of men without causing any comment or being considered an unusual thing.

In the seven tanneries reporting on the occupations in which women were substituted, women were not used until after the skins had been tanned. Then 289 women were employed either to feed sheepskin into a machine, which pressed out the superfluous grease, or to pass pigskins through rollers, which gave them a smooth finish. Other women measured the size of the skins by hand or in an electrical measuring machine and recorded its dimensions. Sorters then separated the skins according to quality, while trimmers cut it into the more important divisions on a cutting machine. Fifty women looked over fine upper leather and rubbed down stains and scratches. As has been stated, women proved very successful in these replacements, and their services were continued after the signing of the armistice.

The largest replacement in shoe factories occurred in the cutting departments. Prior to 1917 women were not employed in these departments save as skivers of uppers—that is, in feeding leather cut into parts for the uppers of shoes into a machine which finished the edges. After our entrance into the war, not only was the employment of women as upper skivers increased and extended to insole skiving, but they filled places vacated by men in the cutting of uppers, linings, and trimmings. The cutting of uppers and linings was done almost entirely by machine. The operator placed the leather or cloth on the cutting board of a power press. A die of the required shape was placed on the material in a manner to permit of cutting the piece or pieces to the best advantage. By pressure on a foot lever or by pulling a hand lever the head of the machine was brought down on the die with sufficient force to cut out the material. Tongues, eyelet facings, and other small parts of uppers were cut out by hand by "trimming cutters." Small pieces of leather left over from cutting the larger parts of the uppers were spread on cutting blocks, the die placed upon them, and struck with a maul. As soon as men were available woman cutters were dismissed except in one establishment, where a few were retained as trimming cutters.

While fewer woman were substituted as "sorters" and "inspectors," 92 out of the 142 reported to have replaced men were retained. These women sorted out soles according to the texture of the leather. Heels were examined for wearing qualities, counters for imperfect ones, and uppers for defects. The assembled shoes were looked over by inspectors and arranged in pairs. Woman sorters were considered as fast workers as men, though woman inspectors turned out only three-fourths as much work.

Among the other work done by women was the molding of fiber board into counters or pieces to be placed in the back of the shoe between the leather and lining. The operator placed a curved counter into the mold of her machine. The press head was brought down upon it by pressure on a foot lever and thus molded the piece into the heel shape. Machines of an automatic character requiring only to be fed and watched were operated by women in the heel and innersole departments.

In one harness shop an attempt was made to train women to become harness makers, but it did not prove successful. In another

shop they were employed at finishing harnesses, operating speed drills, and doing labeling. At this work women did as much or more than their male predecessors, and their services were continued after the war was over. A belting manufacturer found thorough satisfaction with women who had replaced men in his factory as welt manufacturers, matchers, and sewing-machine operators.

TEXTILE OCCUPATIONS.

Although spinning and weaving and sewing have always been done by woman in the textile industries, the war gave occasion for their employment in these capacities in shipyards and airplane and seaplane factories.

Four shipbuilders employed women to spin oakum which was to be used for filling seams between the planks of ships or to stitch fabric into raft covers. The work was done well, but the women were retained in only two firms after the armistice was signed.

In seven airplane and seaplane factories 1,428 women were employed on textile work which men had done in the earlier days of this industry. These girls stitched strips of linen together on sewing machines, making a double-lapped seam. Enough strips were seamed to make pieces of fabric longer and wider than the wings of the planes. Other girls stretched this seamed fabric taut on the wing frame, fastening it by tacking or sewing it to the edges. Many other women were employed to sew taut linen to the frame. At this two women worked together, one standing on either side of the wing, each taking a stitch and passing the threaded needle through the linen to the other side. After the wing was covered with cloth, girls gave it several coats of a special moisture-proof substance called "dope." A few applied varnish over the dope after it had been dried.

After the signing of the armistice only one of the seven firms reporting had retained any of its women workers. This was due to the fact that these airplane and seaplane factories closed down or curtailed their production to such an extent as not to need women. The output of women on these textile jobs had been considered approximately equal to the output of men workers.

ABRASIVE-WHEEL AND GLASS-WORKING OCCUPATIONS.

Women were not reported to have been substituted for men in stone and clay products factories save in the capacities of laborers and cleaners. In making various minerals into abrasive wheels, 159 women were used in men's positions. Plate glass and mirror manufacturers reported 28 substitutions, while optical goods makers employed 501 women on glass work.

In the abrasive-wheel factories three women acted as research laboratorians. Their work was satisfactorily performed and their services were retained after the war had ended. Twenty women molded small wheels by hand and by air pressure. Fifty-nine edged disks and cleaned and shaped the rough wheels on grinders. This work involved holding the disks or wheels against the revolving grinding wheels. Sometimes water flowed over the wheels, lessening the dust thrown into the air but making the hands of the worker sore. Only 13 women were retained in this occupation in the summer of 1919. Those remaining worked on the smaller-sized stock. Others employed

in these factories packed wheels for shipment or wheeled and trucked sand and other stock.

Mirror and plate glass factories used the few women substituted to scratch, polish, clean, and pack glass.

So much of the work done in the optical instrument industry during the war differed from the old peace-time products and so great was the expansion within the industry that it was difficult to separate the women employed to fill men's places from those filling new positions. However, the work done by either group was similar in character. It consisted almost entirely in grinding and polishing lenses, mounting and inspecting them, and in assembling the instrument.

Three out of six firms declared women were appreciably slower than men at grinding and polishing. At mounting and assembling women did as much or more work than men, while at inspection they were slower than men in two out of three factories. According to the women's branch in the industrial service section of Army Ordnance Department the shop superintendent at the Frankford Arsenal claimed women surpassed men in engraving and graduating work. In a factory making panoramic sights, the Government officer stated that the rate of rejection fell from 50 per cent to 15 per cent when women were introduced in the shop.

UNSKILLED MANUAL LABOR.

In 68 of the 562 establishments that form the basis of this analysis of substitution of women in men's places, women were substituted to do unskilled manual labor directly connected with manufacturing processes. While the largest number of plants employing women as laborers were lumber factories, the greatest number of women—838—were employed in this capacity in chemical factories.

Regardless of the industry, the work done by the 2,184 women laborers consisted very largely in transporting material from one section of a factory to another on trucks or by wheelbarrow and in loading and unloading trucks or freight cars. The character of the work accomplished can be ascertained by an enumeration of some of the tasks. For iron and steel mills women unloaded limestone and scrap iron from freight cars. They wheeled and shoveled sand for core makers and carried plates and boxes of cores in the foundries. They trucked and shoveled fertilizer in chemical factories and put it into bags. They wheeled and shoveled coal and sand in a gas plant. They washed barrels and trucks and acted as "roustabouts" in cotton-seed oil mills. In rubber factories workers were supplied with stock and the finished work was taken away from them by women. Bricks and abrasive wheels were carried away from machines in other factories. In the lumber mills women piled boards in layers to permit of a free circulation of air to dry the lumber. They piled the stock on trucks and trucked it from factory to yard, from yard to factory, and from machine to machine. Shipyards employed 403 women to do beck-and-call service wherever necessary.

None of the work required skill. Some of it involved handling light parts, but much of it necessitated lifting and pushing heavy materials. In only a few cases were the actual weights handled by women given, the maximum weight pushed being 750 pounds. Because many women could not lift all the sizes of materials handled in

a factory and therefore had to be assigned only to the lighter work, or because the physical exertion required was such that they could not do as much work as men, women were not considered a great success in 35 out of 57 factories reporting on output. The reason for their success in 22 factories may be illustrated by the following experience:

> The women take lumber from piles and put it on trucks. Two women handle the lumber together. Men always carry one board no matter what its weight; while women carry two if they can make it.

Although 22 firms retained women as laborers, the numbers retained were very much less than the numbers employed by these firms during the war. The 20 firms reporting on the numbers of women employed in August, 1919, had 230 women doing this odd-job work.

MISCELLANEOUS OCCUPATIONS.

Among occupations in which women were substituted, but which do not fall in the other groupings is the assembling of airplanes and musical instruments. In the former, the work done by men was either split into parts so that each woman did only a small part of the work men had done or the women acted as helpers to the men erectors. For musical instruments, motors were assembled and installed by 140 women, while others felted interiors, put hinges on doors, and did other glue assembly work.

A few women were employed as oilers of engines and machines. More acted as forewomen in departments where the majority of workers were women. Elevator operators in shops and scale clerks were frequently named among the new occupations for women.

Throughout the industries a few women were employed in positions left vacant by men as tool-crib attendants, stock-room girls, packers, and wrappers in the shipping room, and as shop clerks. When the parts to be handled were not heavy women succeeded at these tasks.

At the time-honored work of sweeping and cleaning a large group of women were employed. In shipyards, sawmills, and lumber mills 262 women cooked and waited on the table or cleaned the houses in which the employees lived. On such work women were found to be more reliable than men had been.

TRAINING SECURED BY WOMEN DURING THE WAR.

The kind of training secured by women in the plants which substituted them for men during the war was in large part responsible for their successes or failures in their newly undertaken tasks. The burden of this training fell upon the shop foremen, for public and semipublic schools were slow to respond to the widening use of woman labor and few factories had established schools of their own to train new workers at the time of our entrance into the war. As the war progressed, more vestibule schools were organized in factories, and public or semipublic schools opened a few training courses for the war agent and war implement industries to women, but in the majority of plants the employer counted only upon his foreman to instruct women beginners in the new occupations.

It was not always easy to pick out skilled workmen who could impart their knowledge to women successfully, the measure of success, as far as the employer was concerned being the production records of each department. Many foremen resented the introduction of women into their division and did little to aid them in mastering the work. Others earnestly believed that women were not mechanically minded and never would be. When pupils failed to comprehend the mechanical terms these foremen used and were too timid to ask further explanation, such foremen claimed this lack of understanding demonstrated that women could not learn the work. Still other foremen, particularly young men, were overwhelmed with the task assigned them. They lacked the courage to bring poorly done work back to the girl workers, so while the girls continued to make the same errors, thoroughly confident that they were doing good work, unfavorable reports concerning their success were being sent to the office.

But when the manager or superintendent of the plant insisted that women must be taught all parts of the operation correctly, when he watched the foremen as well as the woman workers, changing foremen when foremen seemed at fault and dismissing women who seemed incapable, the manager or representative was able to find a foreman who could be and wished to be a successful instructor of woman beginners as well as supervisor of his department, as the results in the foregoing description of woman workers' successes clearly indicate.

Firms who had thus to rely on the individual capabilities of foremen as teachers stated that they had not installed special instruction courses in their plants either because the working force was too small to permit of this additional expense or because they believed the processes were too simple to need class instruction. Six manufacturers expressed the belief that the overhead expense of giving thorough instruction to women would be too great to make it worth while because of the short working life of the average woman. In this connection it is interesting to consider the lessened turnover, with the obvious attendant decrease in overhead expense, reported by firms providing training schools in their plants.

Thirty firms visited by the agents who secured data on substitution reported that they had trained their new woman workers in vestibule schools during the war. These plants employed 29,989 women and were distributed among the industries as follows: Iron and steel, 15; automobiles and parts, 4; airplanes and parts, 1; electrical machinery, apparatus, and supplies, 2; scientific instruments, 3; optical goods, 1; photographic apparatus, 1; chemicals, 1; rubber, 2.

These factory schools varied in size from the modest one set up in one corner of a large workroom, where five women at a time were instructed in the fundamentals of their work, to the pretentious establishment which in three weeks passed 2,500 workers through an intensive course of training.

A typical school was equipped with facilities for training about 30 women at one time. Arithmetic, blue-print reading, and the use of measuring instruments were taught in addition to the operation of the essential machines. The length of the course varied from 10 days to 3 weeks.

The cost of training has been variously estimated to be from $40 to $200 per new employee, the latter figure including the cost of necessary additional equipment. One firm discovered the cost of school training to be less than shop training.

Three firms found that the vestibule school materially reduced the labor turnover. Women who were not suitable left or were eliminated during the period of instruction. One reported that it resulted in tremendous saving of time, labor, and materials. Nearly all laid emphasis upon the importance of careful selection and placement, an object which to some extent at least was served by the training school.

Favorable reports on the increased efficiency of workers who had received vestibule school training were made by 27 out of the 30 firms maintaining schools. Dissatisfaction with their school experiment was expressed by the 3 remaining employers: One, because women were found to be unsuccessful on the mechanical operation assigned them; another, because the women while learning in the school could not produce as much as while learning in the shop, where they learned more quickly than the men; while the third, whose girls attended a service school on full pay, found the cost excessive because of the large turnover during the training period.

Among those reporting favorable results was the president of a company employing approximately 4,000 women in mechanical operations on fuses and instruments:

> We found that the success of women working in factories depends entirely upon how they are trained to do the work that they never had any training in. If any special work is to be done, and any special machine to be operated, the women should be trained in separate departments, so they can learn the machines and learn the requirements before being placed in the shop on regular work among people who have already been taught the operations.

Another employer having 1,000 women on machine work said:

> The training school equips women with confidence, thoroughness, knowledge, and speed.

The vestibule school had become a permanent part of the shop organization in 17 plants in August, 1919. The other 13 schools were discontinued: 3 for the unsatisfactory results described above; 4 belonged to purely war industries which ceased operation when the war ended; and 6 so reduced their force and curtailed production after the armistice that the expense of maintaining training schools seemed no longer warranted.

The Federal Board for Vocational Education in its report for the fiscal year ended June 30, 1919, states that 10,591 women and girls were enrolled in trade and industrial courses during the year ended June 30, 1918, and that 10,284 were enrolled during the year ended June 30, 1919.[11]

The review given in this report of the trades taught women in Federally-aided day schools (which is also indicative of the trades taught in the evening and part-time schools)—dressmaking, millinery, lampshade making, power sewing machine operating, pasting and leather work, French edge making, embroidery designing, perforating, etc.—reveals clearly that these 20,000 women were not instructed in the mechanical tasks which so many other women were

[11] Information obtained from Federal Board for Vocational Education.

performing in factories during these years. The report in this connection states:[12]

> The occupations for which training is offered are distinctly women's occupations, and raise no debatable issues.

A few of the semipublic schools—schools open to the public free or for a small fee—adapted themselves to the new position of women in industry to some extent. The Rochester Mechanics Institute not only opened all its courses to women but issued an appeal to women to take training which would make of them optical precision operatives. The Franklin Institute of Boston, an evening school, also admitted women to its courses. Other schools, such as the Carnegie Institute of Pittsburgh, gave special classes in drafting and automobile mechanics to women students to meet war needs.

But for the most part, the attention of public and semipublic vocational and technical schools was so overwhelmingly centered on training men for Army employment and on maintaining the growth already attained in civilian training, that with a few exceptions they contributed little to the preparation of women for filling the places left vacant by men in the war agent and implement industries.

The need of offering wider training in the future to the women industrial workers is, however, beginning to be recognized by these bodies. The Federal Board for Vocational Education recommends that:

"A study should be made of the status of women and girls as industrial workers to determine the field for training agencies, which should be used and the subject matter to be included in such training." It also points out that "enlarging the scope of women's work is a matter of breaking down prejudices and seeking an outlook toward better opportunities for them and a broader vision of what technical education may accomplish," and urges State boards to give careful study to the needs and opportunities for the employment and training of girls and women.[13]

Surely there could be no more opportune time than the present to demolish entirely the prejudices already well broken down by the dire need for woman's service during the war and by the confidence in her ability which her efficient performance has earned from the employers of labor.

LIST OF OCCUPATIONS IN WHICH WOMEN WERE SUBSTITUTED FOR MEN.

1. *Blast furnaces and steel works.*—Making chemical analyses of steel, operating crane, loading limestone rock on cars, other laboring jobs about the works.

2. *Smelting and refining of brass and copper.*—Making chemical analyses in laboratory, shearing scrap.

3. *Metal rod, tube, bar, and sheet manufacturing.*—Feeding and taking off in rolling mill, straightening tubes, slitting, trimming, operating press, inspecting in tube mill, inspecting on draw bench, inspecting finishing room, sorting scrap, cutting up scrap on alligator shears, balling up scrap on automatic machine, oiling roll engines, grinding on emery wheels, scouring, inspecting and drying sheets, packing bars, nailing cases, assorting nails, riveting hoops, operating stencil machine, weighing, trucking, operating cranes, testing in laboratory, laboring, machining in repair shop and tool room, shop clerking.

4. *Wire and wire goods manufacture.*—Winding on bobbins, operating stranding machine, braiding wire, weaving netting, weighing, inspecting, operating speed

[12] Third Annual Report of the Federal Board for Vocational Education, p. 70. [13] Ibid., pp. 66 and 71.

lathes, operating light power press, operating light drilling machine, brazing (with a brazier), lacquering, filing.

5. *Foundries (iron, steel, brass, aluminum, etc.).*—Core making by hand, core making by machine, spraying cores, straightening and sorting nails, distributing sand to core makers with wheelbarrow and shovel, carrying plates and boxes of cores, taking cores to and from bake oven conveyors, cleaning and packing cores, sorting castings, grinding castings, chipping with pneumatic hammer and trimming castings, filing castings by hand, drilling, molding, pulling up molds from sand bed and emptying them, inspecting, unloading freight cars of scrap iron, cleaning about yards.

6. *Stoves and furnaces.*—Turning and threading radiator nipples, bushes, and plugs, assembling radiators; operating hand-screw machine on gas stove parts; operating punch press on sheet steel; cutting in tin shops; riveting in tin shops; assembling in tin shops; soldering; spraying and dipping; bench work, as filing, chipping, etc.

7. *Cannon and cannon mount manufacturing.*—Rough boring on gun tubes on gun lathes; planing recuperator forgings on heavy planer operated by hand and foot lever; planing recuperator forgings on power-driven planer; planing bars on Whitcomb planer; shaping of breech mechanism parts on Cincinnati shaper; finishing surfaces of small parts on plain milling machine; boring and countersinking on turret lathe; rough and finished turning on engine lathe of pinions, spindles, and tumblers for gun carriages, plungers, etc.; rough turning and boring axle ends; drilling holes on sensitive and radial drills; grinding plungers on Landis tool grinders; milling the top, bottom, face, and radius of elevating arch on horizontal miller; milling parts on vertical miller; forewoman of drilling department; operating automatic screw machine; slotting on breech mechanism; gear cutting; operating power hack saws; bench work—hand filing of wheels, hand stamping, miscellaneous; inspecting.

8. *High-explosive or shrapnel shell manufacture.*—Shell proper: Hand chipping burrs removed by pneumatic hammer; rough turning to repair eccentric forgings on shells weighing 19½ to 22 pounds; drilling on shell forgings; forge inspecting with gauge; rough turning on engine lathes and on turret lathes; facing base square with body on vertical drilling machine; boring and reaming of thread on turret lathe; milling internal thread on shell nose; finish turning shell body on engine lathe; boring and facing on special-purpose lathes; operating Warner & Swasey screw machines; operating Blood lathes; operating Tapping lathes; drilling fixing-screw hole on sensitive drill; operating hand-screw machines; assembling base plates in shell base with hand hammer; driving in base plates on pneumatic riveters; sawing off square stems on power saw; filing burrs; cutting out copper bands on punch presses; notching on punch press and fitting copper driving band; crimping band on shell by hydraulic press; turning and forming driving band on engine lathe with special forming slides or on brass lathe; stamping name and number on Bliss punch press; notching on emery wheel or by hand with hammer; washing on revolving wheel; varnishing with air-pressure machines; painting by hand; cleaning with cotton; inserting plug with hand wrench; marking; packing; passing shell from boxes to tables; inspecting shells after rough turning, rough boring, finish boring, mouth threading, finish turning, basing, band turning, and final inspection, using gauges and micrometers; finish grinding shell and parts. Fuses: Turning fuse bodies, drilling, milling, reaming, turret lathe work, engraving, assembling, polishing, filing and bench work, tool crib work, inspecting, operating punch press.

9. *Machine-gun and rifle manufacture.*—Rough and finish turning rifle barrel, profiling gun parts, hand milling on gun and rifle parts, reaming, power milling, drilling, operating punch press, polishing, grinding rifle barrel, filing, inspecting, assembling.

10. *Pistol and revolver manufacture.*—Hand milling, machine milling, grinding and polishing, drill-press operating, bench filing, assembling, inspecting.

11. *Torpedo manufacture.*—Threading and burring, inspecting and gauging, polishing, assembling, bench work (small lathe).

12. *Navy float manufacture.*—Acetylene welding.

13. *Cartridge and shot shell manufacture.*[13]—Cartridges: Feeding drawing press, feeding automatic trimming machine, operating case heading machine, feeding mouth annealing machine, feeding head turning machine, feeding tapering press, feeding primer making press, feeding shell priming press, feeding bullet assembling press, plate filling for loading machines, inspecting, operating cartridge-gauging machine, operating cartridge-clipping machine, packing. Shot and shell: Paper shell winding, feeding sizing machine, cutting to length, waterproofing, inspecting wads and shells, feeding paper shell assembly press. Bullet jackets: Operating punch press, inspecting.

[13] The opening of new plants in this manufacture makes it difficult to determine where the line of substitution should be drawn.

14. *Metal work on trench warfare material.*—Grenades: Core making, inspecting, castings, operating lathe on rifle, drilling, inspecting, hammer assembly of springs, fitting plugs, wax dipping. Bomb parts: Drilling, inspecting gears, packing gears, operating power punch press, assembling timing devices, assembling bombs, painting bombs, varnishing bombs, inspecting bombs, acetylene welding.

15. *Steam or gasoline engine, turbine and pump manufacture.*—Cutting blades on presses, assembling blades in rotor disks and segments, calking tubes into tube plates of condensers, assembling pump parts, drilling on governor parts, turning governor parts on engine lathes, milling governor parts, grinding governor parts, assembling governor parts, drilling gasoline engine parts, milling gasoline engine parts, grinding gasoline engine parts, operating semiautomatic lathe, operating turret lathe, erecting, painting, bearing babbitting, filing, packing, stockroom work.

16. *Manufacture of machines, machinery, and parts.*—Cutting, rough and finish threading, and throating chasers on milling machines; rough and finish milling on die blocks; rough and finish grinding on die blocks; turning, milling, threading, drilling, and screw-machine operating on lathe parts; operating milling machines, grinders, turret lathes, and doing bench work on milling machine parts; operating engine lathes, drill presses, and doing assembling on drilling machine parts; operating lathes, drills, and automatic machines, and inspecting and assembling tool-grinding machines; boring, facing, and turning gear blanks on lathe; cutting gears on Fellows gear shaper; operating Gleason generator; milling teeth; burring, filing, and inspection of gear cutting machine parts; operating power punch press on looms and other machine parts; milling on typesetting, cigar, weaving, and other machine parts; drilling (sensitive, multispindle, radial, and vertical) on cigar, weaving, coal-cutting, and other machine parts; operating hand screw machine on various machine parts; operating automatic screw machine on various machine parts; grinding parts of various machines; inspecting parts of various machines; bench work; filing; painting; assembling of parts and of machines; packing.

17. *Tool manufacturing.*—Centering, facing on engine lathe, boring on lathe, rough turning on engine lathe, threading on chasing lathe, profiling, power milling, hand milling, operating automatic screw machine, operating hand screw machine, drilling, counterboring, tapping, grinding (rough and finish), filing, polishing, operating punch press, burring, inspecting with gauges and micrometers, pasting and shellacking, carpentering, wrapping.

18. *Manufacture of cutlery and saws.*—Attending saw-setting machines, milling hack-saw blades and high speed saws, filing hack-saw blades, punching on hack-saw blades, grinding on saws, inspecting saw teeth, attending automatic cutting machines on blades, attending automatic honing machines on blades, attending automatic stropping machines on blades, drilling, threading bolts, riveting pocket cutlery, assembling pocket cutlery.

19. *Manufacture of small machines.*—Sewing machines: Drilling, operating hand milling machine, inspecting with gauges, grinding, polishing, lapping, assembling. Typewriters: Sample writing, fitting ribbon, grinding nickel bars, soldering type, fitting paper feed rolls, fitting segment bars, grinding key levers, reaming and tapping, drilling, assembling, operating punch press, milling, miscellaneous machine operating, bench work. Adding machines: Making springs, bench assembling, operating drill press, operating assembling machines, operating milling machines, spot welding. Cash registers: Operating drill press, operating hand screw machine, operating milling machine, riveting, bench work, assembling, inspecting, packing, operating for tests.

20. *Manufacture of hardware and miscellaneous machine-shop products.*—Bolts, nuts, and screws: Threading bolts, burring nuts, operating hand screw machine on screws, operating drill press, inspecting. Locks: Milling, drilling, assembling, wrapping. Miscellaneous builders' hardware: Operating turret lathe, turning on engine lathe, shaping, milling, operating automatic screw machine, inspecting, assembling, packing. Valves, piston rings, and fittings: Drilling flanges, turning on lathe, threading, rough grinding, magnet heel grinding, assembling, wrapping. Metal mirrors: Wiping. Scales: Operating punch press, drilling.

21. *Manufacture of agricultural implements.*—Turning and boring on lathes, operating turret lathe, milling, drilling, operating hand screw, operating automatic screw machine, gear cutting, rethreading, grinding, operating punch press, filing, other bench work, inspecting, assembling small parts, assembling tractors, assembling radiators, welding, soldering, heating rivets, dry wiping, painting, packing, bowl balancing, drafting, tacking canvas, operating crane, repairing, tool crib work, helping in tool room, laboring.

22. *Manufacture of railway, street car, and field wagon equipment.*—Metal work: Drilling, milling, heating rivets, sticking rivets, threading bolts, operating drawing press. Other work: Handling lumber, operating sanding machine, operating planing

machine, camouflage painting, painting and putting together boxes, mattress working, assembling switches, scrubbing and sweeping, tool crib working, shop clerking.

23. *Metal work in automobile manufacture.*—Operating engine lathe on axle and engine parts; operating turret lathe; operating speed lathe; milling on engine parts; heading and slotting screws; gear cutting; stock chasing; drilling (single and multiple drills); operating punch press; straightening; bench work; inspecting; electric welding; acetylene welding; soldering; riveting; assembling steering gear, transmissions, universal joints, etc.; laboring; upholstering; time keeping.

24. *Manufacture of motor cycles and bicycles.*—Boring and reaming on lathes, drilling, milling, gear cutting, operating gear hopper, inspecting, sanding, helping rivet machine operator, assembling wheels and other parts, packing, wrapping, time keeping and shop office work.

25. *Brass and bronze fabrications.*—Operating speed lathe, operating engine lathe, operating turret lathe, operating hand screw machine, operating automatic screw machine, operating automatic lathe, drilling, milling, grinding, cutting and punching on power and foot presses, soldering, spring making, filing, feeding for electroplating, dusting and shining, assembling, inspecting, wrapping, tool setting, time keeping.

26. *Manufacture of tin and aluminum containers and utensils.*—Casting white metal; cutting sheets on shearing and slitting machines; cutting sheets on punch presses (power, foot, and hand); lock seaming on draw press; soldering; heading; flanging; lithographing labels on tin; welding; buffing and polishing; inspecting; wrapping; salvaging with hammers, pincers, and mallet; operating motor truck.

27. *Manufacture of lanterns and miscellaneous sheet metal work.*—Welding, light punch press work on lanterns, inspecting, buffing, taping, cementing, soldering, assembling, testing.

28. *Aluminum manufacture.*—Operating rodding and carbon setting machines, helping machinists, helping electricians.

29. *Silver manufacture.*—Polishing.

30. *Manufacture of jewelry.*—Polishing, autopower drops, operating power presses, swaging and pointing, operating foot presses, drilling, operating auto presses, stone setting on presses, soldering.

31. *Manufacture of rolled gold.*—Operating small lathes, helping with rolling, cleaning sheets to plate, drawing and tubing.

32. *Manufacture of clocks, watches, and watch cases.*—Cutting on jewel lathes, threading, fine drilling, filing, punching on punch presses (power and foot), sandpapering cases, dipping and lacquering, stringing plates for electroplating, assembling, packing, repairing.

33. *Manufacture of needles and pins.*—Operating power press, roll threading.

34. *Instrument manufacture.*—Operating hand screw machine, operating spindle drill press, assembling, operating precision lathe, operating turret lathe, operating punch press, operating bench lathe, operating milling machine, operating grinding machine, operating engraving machine, inspecting, bench work finishing.

35. *Manufacture of electrical apparatus and supplies.*—Making leads; winding to form armature coils; winding transformer and resistence coils; winding magnet spools; insulating or taping coils; connecting commutators; assembling and connecting armatures; testing for resistance and insulation; operating presses, slitters, and hand screw machines on mica insulations; cleaning spools; molding on hydraulic presses; spooling tissue; spraying; wiring automobiles; press operating on armature bars and plates, switchboard parts, and meter covers; rolling punchings; lathe operating on armature shoulders and on punchings; milling machine operating on turbine bucket wheels and brush holders; drill operating on motor and switchboard parts; screw making on hand and automatic machines; grinding dies; slotting on automatics; stamping and attaching name plates; spinning caps; tapping; stranding wire; braiding wire; assembling; filing and bench work; inspecting; operating millers, lather, drills, and grinders in tool room; designing tools; stock clerking.

36. *Meter and electrical instrument work.*—Scale drawing, jewel shaping on jewelers' lathes, wiring instruments, lathe work, drilling, operating automatic slotting and screw machine, cleaning and attaching back plate of meter to cover.

37. *Manufacture of baking powder and yeast.*—Operating presses for the separation of liquids from solids, washing and emptying centrifugal machines, removing débris.

38. *Manufacture of carbon and polishing preparations.*—Weighing wax, forewoman in charge of inspectors, operating small presses, shipping, machine helping in lithographic press department.

39. *Manufacture of chemicals, acids, and dyestuffs.*—Repairing and washing mitts, filling cans, reading meters, light inspecting, cleaning and sweeping, sewing filled bags, packing and shipping, operating elevator, operating power sewing machine, laboring (handling bark), double seaming cans, side seaming cans, operating small punch press, feeding slitting machine, labeling, operating power presses, stamping tin.

40. *Manufacture of smokeless powder, loading of shells, bags, fuses, and cartridges.*—Smokeless powder manufacture: Operating press, operating cutting machine, temperature reading, moisture testing, ether weighing, forewomen, commissary work, laundry work, bag repairing, routine analysis. Loading shells: Removing shipping plugs, washing shells, weighing shells, cleaning threads, gauging, polishing cartridge case mouth (using lathe chuck and emery cloth), wiping case, hand-press stamping, painting groove in cartridge case, weighing powder, loading case with powder, packing shells. Bag loading: Weighing powder, filling bags, operating power sewing machines on bags, assembling and wrapping bags. Fuse loading: Disassembling fuse parts, placing detonators, inserting washers, painting socket threads, screwing sockets, wrapping fuse with tape, operating Battle crimping machine, operating pelleting machine, operating charging machine, operating pressing machine. Cartridge loading: Operating cartridge loading machine.

41. *Manufacture of fertilizers.*—Sewing bags by hand; trucking, shoveling, bagging, and loading; sweeping; grinding bone; coopering; tending dry kiln.

42. *Manufacture of illuminating and heating gas.*—Shoveling and wheeling coal, sand, etc.; lamp trimming; meter repairing; stove adjusting; meter reading; collecting; assisting chemists; candlepower testing; valve regulators; stock-room checking; cleaning, adjusting, and repairing gas lamps.

43. *Manufacture of grease, tallow, soap, candles, and glue.*—Handling glue nets, mixing room helpers, operating automatic soap-cutting machine, feeding automatic soap-stamping machine, feeding automatic soap-wrapping machine, operating automatic machines for packing soap powder, stitching and riveting boxes.

44. *Manufacture of oils from plant, fish, and animal life.*—Trucking, handling bags, sewing, cleaning fillers, crushing seed, laboring, operating power sewing machine on bags, oiling engines, operating grabbot gin, sweeping, assisting in cotton press room.

45. *Manufacture of paints and varnishes.*—Labeling, shipping, mill operating, filling cans, rag cutting.

46. *Manufacture of druggists' preparations.*—Pressing tablets, labeling, janitors' work.

47. *Refining of petroleum.*—Operating punch press, operating drill press, tool-house checking, operating service station, testing in laboratory, geological work, drafting, laboring, waiting on table, driving electric truck, driving automobile, driving horses, cleaning yards.

48. *Logging camps.*—Signal work, cooking, helping in kitchen and dining room ("flunkies"), taking care of bunk houses.

49. *Sawmills.*—Controlling chain and live-roll movements, operating hogging machine, piling lumber, trucking, oiling, cleaning or sweeping, handling lumber in yard, taking care of boarding house ("flunkies"), shop clerical work.

50. *Planing mills.*—Off-bearing, grading, sorting, bundling, tying, marking, loading.

51. *Manufacture of shingles and staves, barrel heads, and other mill by-products.*—Stock picking, operating cut-off saw, operating jointer, operating small planer, operating matcher, operating barking machine, helping machine feeders, off-bearing, bundling, tying, shingle packing, loading, laboring.

52. *Manufacture of sashes, doors, blinds, moldings, and other kinds of builders' materials.*—Operating cut-off saw, operating mortising machine, operating sticker machine, machine helping, operating sanding machine, off-bearing, assembling and pumicing sashes, bundling small moldings, matching parquet flooring, tying flooring, finishing woodwork, cleat gang work, loading and unloading trucks, glazing.

53. *Wooden packing box and cooperage manufacture.*—Operating boring machine, operating grooving machine, operating nailing machine, operating matching machine, operating stapling machine, helping rip sawyer, off-bearing, printing, painting, laboring, matching and sorting staves, operating sander, helping hoop machine, operating pail-sealing machine, gluing, putting on wire seals, assembling pail heads, packing, sweeping.

54. *Veneer manufacture.*—Operating veneer saw; off-bearing; sorting, inspecting, and piling; feeding and taking away from dryer; assembling and gluing; splicing; operating boring machine; feeding dovetailing machine; sawing wedges; operating veneer taping machine; operating drum sander; stockroom work.

55. *Manufacture of furniture.*—Marking for sawyers; operating band and circular saw; operating trimmer; boring; mortising; planing; sanding (belt and drum); operating lathe; knob turning; spindle carving; press carving; composition carving; stenciling; cleaning carving; machine helping; off-bearing; cabinet making; helping cabinetmakers; nailing and gluing; finishing; staining; filling; varnishing; hand sanding; rubbing or polishing; sponging; gluing on ornaments; setting mirrors in frames; assembling small cabinets; making type cases; rubber-stamp molding; making pads; caning chairs; operating elevator; laboring.

56. *Manufacture of miscellaneous woodwork.*—Wheels: Operating spoke-finishing machine, boring felloes, sanding felloes, filling spoke crevices, sorting spokes, sawing spoke handles, planing, painting wheels, trucking and piling, helping. Wagons and cars: Planing, sanding, painting. Other wooden articles: Making snap flasks by machine; cork-machine splitting; sandpapering coat hangers; nailing and riveting ironing boards; laying webs for bee baskets; gluing, tacking, and trimming linings to coffins; operating match machine; sweeping.

57. *Airplane and seaplane manufacture.*—Metal work: Turning on turret lathe, turning on speed lathe, drilling, milling engine parts, profiling engine parts, grinding engine parts, cutting and threading on hand-screw machine, punching on punch press, filing, layout work, keeping tool room, acetylene and electric welding, brazing, helping coppersmith, sheet-metal working, coppering struts, tube bending, splicing cable, wrapping wire, soldering wire, enameling, electric rivet heating, scraping, forewomen, inspecting. Woodwork: Operating band saw, helping jointer, helping molder, helping strut lathe worker, helping variety sawyer, helping band resawyer, helping power feed rip sawyer, helping cabinetmaker, sanding, gluing, finishing, building small wooden boats, painting and varnishing, assembling webs, constructing panels. Textile work: Operating sewing machine; covering, gluing, and sewing canvas on wings, etc.; doping; inspecting. Miscellaneous work: Wiring up, assisting airplane erectors, mechanical drafting, photographing, charting.

58. *Manufacture of musical instruments.*—Metal work: Operating hand-screw machine, drilling, milling. Woodwork: Helping planers, off-bearing in mill room, helping cabinetmakers, hand sanding, varnishing and staining, assembling sound boxes. Miscellaneous work: Motor assembling for phonographs, installing motors in phonographs, trimming and fly finishing, felting interiors, string spinning, electroplate stringing and cleaning, player-action work.

59. *Shipbuilding.*—Metal work: Electric welding, reamer sharpening, bolt and nut threading and oiling, machine-shop helping, tool keeping. Textile work: Oakum spinning, asbestos work, raft cover sewing. Miscellaneous: Sorting refuse, sweeping ships, janitor work in shops, handling lumber, driving automobile, driving truck, working in restaurant, working in office.

60. *Rubber manufacture.*—Running rubber washing machines, running refining and straining machine, separating rubber sheets, grinding rubber, molding rubber heels, cutting and splicing fabric for balloons, making boots, cutting fabrics for tires, joining fabric, making beads, cutting treads, cording tires, finishing tires, inspecting tires, making inner tubes, boxing inner tubes and tires, taping wire coils, weighing rubber and tires, making patches and repairing tires, trucking, stock labeling and inspecting, cleaning.

61. *Tanning leather.*—Operating putting-out machines, operating rollers, operating oiling-off machines, measuring skins by hand and machine, sorting skins, trimming, hand finishing.

62. *Manufacture of shoes, harnesses, and miscellaneous leather goods.*—Cutting uppers, linings, and trimmings; skiving uppers and insoles; sorting cut soles, uppers, heels, etc.; molding counters; sorting counters; stamping and slashing insoles; gauging heel lifts; tending heeling machine; inspecting and mating; assistant forewomen; miscellaneous minor operations on shoes; harness maker apprentice; harness finishing; running speed drills; labeling; operating sewing machines; matching belts; measuring belts; making welt on belts; operating elevators.

63. *Clay and glass manufacture.*—Off-bearing brick, polishing and cleaning mirrors, cleaning and packing glass, making clay rolls, helping in puddling, molding small carborundum wheels by hand and by air pressure, cleaning saggers and resistance rods, disk finishing, packing, trucking, molding paper stock, research laboratory work, sweeping, laboring, shop clerking. Metal work: Drilling, gear hobbing, milling, operating punch press, bench assembling.

64. *Manufacture of optical goods and photographic supplies.*—Lens grinding and polishing; lens mounting; lens inspecting; cutting and marking; bench assembling; forewomen; winding paper rolls, spooling and machine assembling in photographic supply factory. Metal work: Operating lathe, operating screw machine, milling, drilling, grinding, press work, inspecting.

APPENDIX A.

Selected letters from employers (whose names will be furnished upon request) supplementing or explaining answers to questionnaires concerning the results of the employment of woman labor during and after the war.

These letters have been carefully selected to indicate the conditions surrounding both successes and failures of woman workers.

The president of a recording and computing machine company in Ohio writes:

There is no department where light machinery is used that women can not be trained to do the same work that men have been doing, and do the work better and get out greater production. We found that the success of women working in factories depends entirely on how they are trained to do work that they never had any training in. If any special work is to be done and any special machine to be operated, the women should be trained in separate departments so that they can learn the machines and learn the requirements before being placed in the shop on regular work among people who have already been taught the operations.

During the past four or five years we have had between 8,000 and 9,000 people at work, and about half or more than half of the number of employees were women. We selected them very carefully before giving them employment and tried to confine our employment to American girls or American born. The results of our work during the past several years is well known in Washington and among certain customers who have seen fit to give us their work.

We were released from all Government work two weeks ago and will now get back to commercial production, and we hope soon to be running full force again, at which time let me assure you that our force will be composed of as many women as it is possible for us to get for doing the work.

In a later letter he says:

In reference to the occupations in which women have replaced men, the following may give you some idea of the diversity of the work: In the machine department women became expert and got out much greater production in running turret lathes, punch presses, bench lathes, milling machines, drill presses, grinding machines and engraving machines, and in addition to the operation of these machines, we taught them to grind their tools, to act as job setters, and to superintend some of the departments. In the inspection department practically every inspector was a woman. In the assembly departments, as well as in the inspection departments, all were women, and they did better work and got out more production than men, whom we tried on the job at various times without success. We found, too, that we could place as much, if not more, dependence in women in coming to their work and remaining on the job, which accounts for our having the lowest turnover in help in any factory ever heard of, which was less than 4 per cent per year. We taught women to inspect tools and check them over according to the drawings after they came from the tool shop, in which department women became expert. In the optical department most of the employees grinding lenses were women, who were remarkably successful in the work. In the assembling of lenses we had none but women on the job, and you will find by inquiring at the Ordnance Department that our lenses and prisms were as fine as any in the world.

Our experience has taught us many things in the employment of women, which if properly applied would, in my opinion, bring success in many factories where at the present time they are practically failures. We are now going into a new field of commercial work—manufacturing an article that was never known in this part of the country, embracing a combination of mechanical and electrical elements, for which we are training girls to carry on the work, and the short time they have been on the work and the development shown by them proves again that women, if properly trained, can do as well if not better than men in any kind of mechanical work.

From a manufacturer of scientific instruments:

We employed a maximum of 75 women in our instrument department for about 14 months on assembling and bench work in connection with the manufacture of these instruments. This work we had done before in a small way, most of the work being done by men. However, during the war we manufactured these instruments in large quantities, and a good many of the smaller operations on the instruments were performed by women.

There was actually no replacement of men on this work, except in a few instances in our machine department, where women were being taught to operate turret lathes. Our experience had just really begun in the matter of teaching women to operate machines when the war came to a conclusion, and our work on these instruments automatically stopped. We have no women in our factory at the present time, our factory work now being done, as before the war, entirely by men.

In conclusion, the work that the women performed while we employed them was adapted naturally to women, because of its fineness; that is, the parts were small, and required deftness of fingers as well as patience. The women performed this work very well, and should we again manufacture these same instruments, we would employ women for this same work.

From a company manufacturing brass and steel goods in Connecticut:

May we explain that we took on women in our plant for the war period only, and we, therefore, could not compare the production of women with the production of men, as they did not work on the same jobs. We have now entirely discontinued the war work, and have no women in our plant at all. No changes were necessary in the machinery or equipment, as we built up an entirely new department, with new machinery, equipment, etc., with the express intention of employing women on particular operations.

We would have continued to employ the women had we continued on the work which we were doing during the war. We might also state that the use of women in our plant was very successful, and we most certainly would use women in the future on any similar work or on any work which we may take up in the future of a light character suitable for the employment of women.

Supplementing the foregoing information a later letter states:

At that time we had women working on small sheet-metal parts with the approximate number and operations as follows: Ninety bench drilling, 10 power punch presses, 80 assembling, 25 inspecting, 10 spring making. Total number in plant June, 1916, 50; total number in plant November, 1918, 320; total number in plant August, 1919, 75.

The secretary and treasurer of a metal manufacturing company in Tennessee writes:

Our employees are practically 100 per cent citizens of the United States. The women have replaced men mainly in our sheet metal manufacturing plant. These are paid by the piece, the tasks accomplished are the same as by men, and they are consequently paid the same compensation. They use the same machinery and are equipped the same.

We expect to continue employment of women in these occupations. They are given the same training and supervision. We consider them equal to men in point of success.

In a later letter he says:

We have placed no restrictions whatever on women's employment in our tin factory, and find their attainments up to the average of the masculine labor.

From a steel company in Pennsylvania:

Answering your letter of October 28, we submit the following information in answer to your queries:

Total number of male and female employees (exclusive of clerical forces) in June, 1916—male, 3,556; female, none; November, 1918, male, 3,658, female, 131; August, 1919, male, 4,073, female, none.

Number of women in different occupations: Machine helpers, 65; motor truckers, 4; galvanize inspectors, 8; nail assorters, 10; engine oilers, 2; weighers, 12; hoop riveters, 6; clerks, 22; stencil-machine operators, 2; total, 131.

Relative rate of pay was the same per hour, but the women worked only 8½ hours per day while the men worked 12.

Relative output was the same as men.

In another letter this firm writes:

The women employed gave complete satisfaction, and can be termed as having met with success, but due to the Government regulations limiting the number of hours that a woman can work, it was necessary to leave all but clerks go upon the return of soldiers.

From a steel products company in Michigan:

We find women adapt themselves to piecework on light work very nicely, but in most cases do not compare favorably with men on miscellaneous work requiring the adjusting of machines, etc.

This firm reported no special training given to women. The firm also reported the employment of 20 women nine months after the signing of the armistice as compared with 113 women in January, 1918.

From an employment manager of a pressed steel company in Maryland:

Would say, however, that we found our women workers very efficient on the character of work that we were doing for the Government, but at the present time the character of our work is such that we have deemed it advisable to employ men only.

In a later letter he says:

Supplementing our letter of October 14 and replying to your letter of October 27, in which you ask for the number and occupations of women employed in November, 1918, wish to state that we employed 125 women as drill press and lathe operators and inspectors on our war contracts.

In August, 1919, there were no women employed in our civilian work at all, for the reason as stated in my letter of October 14. The number of men employed in August, 1919, was about 400. The total number of employees in August–November, 1918, was approximately 1,200.

In reference to the last paragraph of your letter, regarding the relative rate of pay and output as compared with men on the same job, would state that the pay was approximately the same, while the work as turned out by the women, we might say, had a shade the better. We found that women in these respective positions were more than encouraging, and should we in the future undertake work of a similar nature we would not hesitate to put women back in these positions.

From the general manager of a tool company in Pennsylvania:

Women are not desirable in our work because of lack of physical endurance and training, nor are they temperamentally capable of attaining the same efficiency in machine work as a man.

From the assistant superintendent of a brass company in Wisconsin:

Occupations in which women have replaced men (exclusive of clerical force).

Occupation.	Number.	Rate of pay.[1]		Relative output.		Remarks.
		Men.	Women.	Men.	Women.	
				Per ct.	*Per ct.*	
Sweeping floors	3	$0.30	$0.30	100	100	
Inspecting and packing	3	.30	.....	.....	.....	
Inspecting	52	.30 to .325	.35	100	100	
Presses	5	.325	.35	100	100	
Trimming machines	4	.325	.35	100	115	These machines very well adapted to a woman's small fingers.
Small rolls	5	.30	.35	100	90	Not suitable for women on account of weight lifting.
Common labor	99	.30 to .325	.35	.....	.....	Women not suitable on account of lifting weights.

[1] Men were no longer employed when women were put on these jobs; wage rates, therefore, represent rates of two different periods.

There were no changes necessary in machinery or equipment to employ women.

We do not expect to continue employing women on any of these occupations on account of the large proportion of our work requiring heavy lifting. The 34 women now employed we will replace with men as soon as housing conditions and other causes which cause our present shortage in male labor have been corrected.

In regard to the success or failure of women employed on above jobs, their work was satisfactory.

From the superintendent of a company making weaving machinery in Massachusetts:

Women in our plant are working on drill presses, radial drills, milling machines, hand-screw machines, and light bench work. We find we receive best results from their efforts on drill presses. You understand that this work is not of a heavy nature, but we feel very much satisfied with the way women are handling the jobs we have given them.

From an iron company (also handling limestone rock) in Tennessee:

Some time during the summer of 1918 two young ladies applied to our foreman at our limestone quarry for work, stating they wanted to help load rock. They were given employment and worked something like six weeks. This class of work is of course very hard, and it would be almost impossible for a young lady to do the work of a man, so the young ladies were given $2 per day (while men were paid $3 per day) and were allowed to take their time and work as they liked. Will say that their work and efforts were very creditable; they did much more work than was anticipated. The young ladies used overalls in their work.

Answering your questions: The work done was loading limestone rock on small cars. The women did possibly about two-thirds of the work done by men. No tabulation was kept along this line.

We can not think that this would be a successful line of work in any way for women. The young ladies quit of their own accord after some five or six weeks. We think they found the work too severe.

From the president of an electric and manufacturing company in Pennsylvania:

We ordinarily use girls on a large variety of what might be termed "electrical work," such as winding, insulating, and mica operations. We have for a number of years been extending the use of girls to mechanical operations such as punch presses on detail work, small drill presses, mechanical assembling, etc. During the year we extended the use of girls to numerous other operations, such as running band-saw filing machines, work on hand-screw machines, and machine tools of various kinds, both in the manufacturing departments and tool rooms. They proved very adaptable, and the results were quite satisfactory. Wherever the work was of repetition nature and suitable for them, we found that we were able to secure a greater output from them than from the class of men or boys who were formerly employed for such work and an occasional girl developed unusual skill.

It is our practice to pay women the same as men for an equivalent return of work, and on a good many classes of work which were performed on a piecework basis the girls earned more than the men or boys they replaced.

In some cases it was necessary to make a number of changes in the way of safeguards, particularly in connection with punch presses and screw machines, before permitting the girls to work on them.

The number of girls we employed during the war was limited only by the supply. We employed about 2,000 in our main plant, and about 300 of these were working on operations which had never been performed by girls before.

All the girls who were employed on unusual operations were put through special training rooms and this practice is being continued.

The operations on which we will use women in the future will be determined by the demands upon us and the supply of labor.

From a manufacturer of electric motors:

Our product is electric motors, generators, etc.

During the war we employed 100 or more women in the places of men and boys on light assembly work of various kinds, drill presses, power presses, milling machines, grinders, hand-screw machines, and light bench work.

It was necessary to put additional guards on some machines to protect the skirts and hair of the women operators. In some cases we supplied stools for them to sit on.

It was also necessary in some departments to put in separate toilet facilities for the women, as previously there had been nothing but men in the department.

We do not expect to continue employing women in place of men in most places. We now have about 20.

Our experience did not show any advantage in employing women: the machine workers especially soon became less reliable and easier "floaters" than the men, and the discipline in the department where men and women worked together suffered considerably.

Starting rate for women was about 10 per cent less than the starting rate for men, but after they were trained sufficiently to go on piecework, piece rates were the same for men and women.

From the president of a piano company in Massachusetts:

In reply to your favor of the 8th, we have practically no women employees now because we made an arrangement with our men when they came back from the service that we would use them in place of women.

As to their work, for many reasons we consider them superior to men, particularly in those operations which demand rapidity and neatness.

We are planning as we grow to gradually add women in certain departments where they are better fitted than men.

We are building pianos and player pianos exclusively.

No change is necessary in machinery or equipment in employment of women.

From the chief executive of a bag-loading plant (explosives) in New Jersey:

You will be interested to know that throughout the whole of the work, which we contemplated from the beginning, our plans were made for the employment of women in every possible position which it was considered they would be capable of filling, and in many instances where heavy physical labor would be required either the operations were further subdivided or else suitable mechanical means were installed so that these operations could be successfully carried out by women workers, and our general experience established a correctness of our ideas, as we were able to employ not less than 80 per cent women in the manufacturing operations of the plant, and at one time our employees rose to a total number of about 6,500 people.

Furthermore, we are pleased to state that the enthusiasm, patriotism, and earnest endeavors of the women workers were the mainstay of this plant, and as we received an Ordnance flag for production the results are conclusive of the effectiveness of their work.

Women came to us from all walks of life, many of them never having done manufacturing work before, and were in no wise familiar with factory work and conditions. We had artists, operatic singers, actresses, moving-picture stars, society women, school teachers, writers, women reporters, as well as many girls who had previously been employed as sales people in the larger stores of the surrounding territory; also a fair percentage of women from the homes, many of them being mothers of grown families.

We are unable to give you a percentage basis for comparison of women's work with the production of man, because of the fact that the work which we were doing down here had not hitherto been functionalized by the Government or by private manufacturers, and what it was necessary for us to do was to develop an entirely new working force and to evolve the manufacturing process from the whole cloth.

Every one, both men and women, who came on the plant went through a training course, and we maintained a school of some considerable proportions, and we increased our force in the beginning of the work from 500 to 3,000 in three weeks, and passed all of these people in that period through preliminary training—intensified, of course, by the fact that their willing cooperation made a successful undertaking.

From the vice president of a tank and pipe company in California:

Replying to your letter of the 22d ultimo, would say that for a short time during the war we employed 17 female operators in our plant, but replaced them with men because our installation was such that we had no accommodations for women, and, although their work was very satisfactory, indeed, it seemed to us best not to continue the experiment, particularly since they all found ready employment in local canneries and elsewhere.

The change was made entirely because we were not able to properly care for them without expensive addition to our plant. The pay of the women employees was the same as that of the men for the same service and the output was practically the same.

From the superintendent of an automobile body corporation in Ohio:

Your communication of October 8 received in reference to employing girls, and we wish to say that we did employ 115 girls during the war time on welding and filing of aeroplane parts. These parts, of course, were very small and intricate. Our regular standard line of work is so large and heavy that it is impossible for us to use girls on this work; therefore we do not employ any girls in the factory.

We wish to say in reference to the girls whom we had working on the Government work that the work which they did was on a par with the work as made by men, and their services were entirely satisfactory to us from the point of quality as well as production.

From the manager of a medical manufacturing company in Tennessee:

Replying to your letter of October 8 in regard to substituting women during the period of the war, will say that we did substitute a few women in our packing department for a short time, but found that they were not physically strong, and have dispensed with them entirely in the packing department.

From the manager of a cottonseed oil company in Oklahoma:

We have your letter of October 18. Commenting and inquiring on our replies to your questionnaire of October 9, we substituted women in our lint room last season and they were satisfactory in every regard. We do not, however, expect to use them this year for this reason: The oil-mill industry in this section, and, in fact, all over the South, runs on what we call a 12-hour basis, while in this State we are unable to work the women under State law for a longer period than nine hours. Hence, in order to make the combination, we had some women who were working an eight-hour shift, and made the change of shifts irregular as compared with the regular run or the change for the men crew. This was unsatisfactory.

However, should we ever be able to put the cottonseed oil industry on an eight-hour basis, I have no doubt but that women could render efficient service in several departments of the mill. Particularly in the lint room in cleaning up and carrying lint from the linters to the balers.

In addition, in our bag department, we have found women, of course, most satisfactory on the patching machine.

Have used them for cutting bags and counting and sorting bags, and have found them in every particular as efficient, and I might say, even more satisfactory than men in this particular class of work. We are using, at the present time, a small force of women; one turning, one sewing, and one sorting and counting.

From a lumber manufacturing company in Arkansas:

We are manufacturers of hardwood lumber, and during the period of the war operated sawmills only. We employed during that period a number of negro women in our plants and on our lumber yards. For the most part the work in and around our plants is too heavy for women to perform. There were some places, however, where we could use negro women to fairly good advantage, where the work was light and a minimum of danger

The negro women employed by us gave fairly satisfactory service, but on account of the character of work around a sawmill plant, as explained above, a woman can not do the work in nearly so satisfactory a manner as a man, for the reason that they are not physically able to do so. However, the women employed by us showed a willingness to perform the tasks set for them to the very best of their ability and strength, and all of them seemed to take a pride in the fact that they were doing war work. A large number of the women employed by us had husbands in the war.

We are also frank to say that had we not been able to secure the services of the women employed by us during the war we would have been either unable to operate at all, or our operations would have been seriously curtailed. As a matter of fact we are still employing 10 or 15 negro women who worked for us during the war, and who seem to prefer this class of work to domestic or farm work. We are of the opinion, however, that the work in an average sawmill manufacturing hardwood lumber is entirely too heavy for a white woman, and also for most negro women.

A history of our experience in this line will probably not be so valuable to you as that of other woodworking plants, where the labor to be performed is not heavy, and where women could perform such labor to much better advantage than with us.

From the manager of a manufacturing company in Oregon:

The 25 women referred to came from housekeeping and other work about home and were all white; they did not replace men except in the sense that men were not available. They were put at work sorting and handling light lumber in the planing mill department, at approximately 80 per cent of the rate paid men and as near as we can tell with that or a smaller relative output. There were no changes in machinery or equipment necessary except lavatories and rest rooms, and the women had no special training. As soon as the armistice was signed, these women left the work because they did not especially enjoy it, and were only doing it as a patriotic duty. As far as we know they went back to their original employment.

We could not say they were either a success or failure in the experiment, but simply a necessity arising out of the fact that 136 out of our 750 employees went into the service and some one had to take their places. As soon as the necessity passed we went back to our old program.

We do not think women should be or can be successfully employed in lumber manufacturing, although there is a place for them in box factories and other industries connected with the lumber business, where the work is not as heavy as in our operations.

From the president of a company manufacturing kitchen cabinets in Indiana:

We do not find women as efficient and capable, although there were a few exceptions to the rule.

Our failure to obtain satisfactory results may have been due largely to our inexperience or the peculiarities of our system or work.

Girls were used to off-bear on the machines. In using boys for this purpose they were expected to not only take away the material, but move trucks and keep empty trucks up to the machines. Our operators invariably did not ask so much of the girls, and as a result the output of the machines was seriously handicapped.

From the president of a sled manufacturing company in Michigan.

The employment of women up to date, in the mechanical arts, is a partial success, determined solely by the disposition of the individual employed. We have had women do more work in nine hours than our best men have been able to do in 10. These are exceptional cases.

The great objection to employing women is the fact of the nine-hour limit, and it is the opinion of the writer that the nine-hour law has done as much to produce the industrial unrest in this country as any other feature. It is a purely political or class distinction, which deprives certain individuals in the United States of the right to labor as they would like or desire to, and is put up not for the benefit of these women but for the benefit and at the instigation of labor universally.

Of course, the ground on which these laws were passed is one of health, but this might better be conserved if the law should read that no woman who works in an industry 10 hours a day should do any housework at home. Of course, the writer understands that this is preposterous, but not any more so than their hours of labor in industry. The chances are that in the average industry of mechanical arts women are much better off working in a factory 10 hours a day in a sanitary condition than four or five hours housework in the home in insanitary conditions.

The writer hates to see the foundation of the law camouflaged by something that is entirely impractical from any just viewpoint.

It is the writer's opinion that most women of ordinary intelligence, where they really want to work, or earn wages, and will take hold of any certain job with that intent, can produce as much on a machine as a man, and very often, in a much more satisfactory manner. The training that they require in preparation is more a training of the mind and disposition than of the muscles. Whenever you can instill into the mind interest in things mechanical, a desire to produce all that is possible and reasonable in the way of necessary movements, a desire to stick to one job until it is learned how to do it as well as anybody can, you will have ideal workwomen.

The regular habits induced by a studied job are much more conducive to good health than the irregular conditions of home life. Of course, another form of education must be brought about, and that is that women who work shall remain as high in the social scale as those who do not work. It is a very, very difficult proposition. This is proven by the fact that our best workwomen were invariably those who enlisted during the war time for patriotic motives and quit as soon as the armistice was signed; the women who did not have to work, but who entered into the labor with the sole idea of helping as much as they could, regardless of compensation. These are the women that produced more and got paid for it.

From a boot and shoe manuafcturer in New Hampshire:

Present production: Men's and boys' shoes, Goodyear and McKay; upper-leather tannery, sole-leather tannery, leatherboard mill, chemical factory and box factory.

Number of employees: June, 1916, men, 4,000; women 1,200. August, 1919, men, 3,300; women, 2,000.

Number of women on work formerly done by men: August, 1918, 629 (maximum number); November, 1918, 609; December, 1918, 570; October, 1919, 200.

NOTE.—The increase in women employees over and above the 200 mentioned is due to several circumstances, such as the elimination of a large number of men on such work as hobnailing Army shoes, and the increase in women stitchers due to release of the war-time restrictions on fancy patterns, perforations, stitching, etc.

Nationality of women in our employ runs about as follows: American and French Canadian, 70 per cent; Greek, 20 per cent; miscellaneous, 10 per cent.

Occupations in which women have replaced men (probably permanently).

Factory.	Occupation.	Number.	Relative rate of—	
			Pay.	Output.
			Per cent.	*Per cent.*
Sole leather	Sort sole leather trimmings	40	100	100
Upper leather tannery	Hand finishing	10	100	100
Do	Measuring machine	4	100	100
Upper leather cutting	Sort and trim remnants	30	100	100
Counter	Mold counters	5	100	100
Do	Sort counters	2	100	100
Shoe factories	Innersole department	20	100	100
Do	Tend heeling machine	25	100	100
Do	Inspecting and mating out	10	75	75
Do	Assistant forewomen	8	100	100
Do	Miscellaneous operations	46	100	100
Total		200		

No changes were necessary in the machines or equipment used, beyond providing some of the women with womanalls and making the necessary washroom and toilet provision in departments which had formerly been 100 per cent men.

The operations listed above are those which will probably continue employing women. The 400 odd women used to replace men during the labor shortage last year were on operations where their output, and consequently their rate of pay, ran from 75 per cent to 80 per cent of that obtained by men. This was due largely to the physical exertion required. As a war emergency, particularly on upper leather cutting, it carried us through the period of labor shortage, but when it became possible to obtain experienced men to do these same operations, the substitution was made. This change has taken place gradually, many of the women dropping out when their men came back from military service. On these operations there was always a considerable rotation of employment, and by filling the vacant places by men instead of putting in other women the change was effected gradually.

No additional program for training or supervision of women in our plants is contemplated at the present time. We have had for several years a competent medical service in our plants, and within the last two years have placed employment supervisors in every plant whose duties include supervision of wages, working conditions, and any other difficulties which the operators may have.

This is partly answered in paragraph 6. Women carried us through the labor shortage, but are not a permanent proposition except on the operations mentioned above. The use of women had not been previously made, merely because the departments had always been 100 per cent men, and the introduction of one or two girls into a room of 100 to 150 men would have had an undesirable effect upon the discipline of the room. During the last two years, however, this prejudice has been broken down, and we are able to use a few girls in a large department of men without causing any comment or being considered an unusual thing.

From another shoe manufacturer in New Hampshire:

It is true that, in common with other industrial establishments, we did employ quite a number of women during the war period. Perhaps it would be well to make clear our position in this matter in order that the answers to the following questions may clearly state our position.

In the first place, we looked upon the employment of these women as a purely temporary proposition with no idea of making them permanent employees in our establishment to the exclusion of men who had heretofore worked on certain manufacturing processes. The greater number of these women were employed in the manufacture of canvas saddle bags, pannier bags, helmet linings, leggings, and articles of a similar nature. This work was a "sewing machine proposition" in which the women would be much more efficient than men in ordinary circumstances. We believe that most of our women employees looked upon their positions with us as temporary, and that the work would cease at the end of hostilities. At the present time, we know of no positions in the factory in which women are holding the positions that were formerly held by men; in fact, we are back on a normal basis. Following are the answers to the questions which you have asked:

Our present product is men's and boy's Goodyear welt shoes. The number of employees, exclusive of clerical force, was in June, 1916, about 1,300, about 60 per cent of whom were men. The number of employees of August, 1919, exclusive of clerical force, was about 1,200, with about the same proportion of men employees.

Our report of October 30, 1918, stated that we had employed about a hundred women in place of men, but these were on minor operations, mostly in the heel and innersole department, but these places have since been given back to a great extent to our returning service men. Women were employed in making ordnance equipment which necessitated the installation of many high-powered sewing machines, also eyeletting and riveting machines.

We are no longer employing women in these operations, as this work terminated with the signing of the armistice. We have no special plans for training or supervision other than our established policy of handling new employees.

We are very glad to say that the women who came to us during the war period were willing, able, and efficient workers, and we regret exceedingly that we could not make use of the services of many more of these women in our regular lines of work.

From the third vice president of a harness and saddlery manufactory in Kentucky:

The 11 women we had working in our factory for a short time were not harness makers, nor had they ever worked at the trade. We employed them with the idea of schooling them to do the work.

To teach them the trade it was necessary to have a skilled mechanic over them, but as we could get no experienced woman harness maker, we dispensed with their services for the reason that they were not satisfactory working under a foreman.

From a manufacturer of rubber and gas masks:

For your information the following is a statement as to the factory enrollment as per your request:

November 15, 1918: Females, 2,417; males, 10,645; total, 13,062. October 15, 1919: Females, 1,702; males, 16,429; total, 18,131.

The loss of 700 female employees is explained as follows: Four hundred female workers left our employ directly after the armistice was signed. These employees were women who had responded to the patriotic call for workers on gas masks, who never had done any actual factory work previous to this call. They represented women from the best families in the city, both single and married, and who would not under any circumstances work on the average factory work, although they proved to be superior to the average factory female worker while engaged upon their particular war work.

The other 300 were distributed throughout our tire department and several other departments where men were formerly employed. Owing to the continuous operation of 24 hours a day in the tire department, it did not prove to be the attractive work for women. While a great number remained, and are still at work, there is a shrinkage which we did not attempt to replace with women, giving the jobs to the unemployed soldier in preference. The work done in the tire department is known as preparing stock and covers several operations, such as cutting treads, cutting plies, and cutting side strips.

In an earlier letter this firm wrote:

Replying to your letter of October 16, I beg to advise that during the war we employed a large number of extra women in the production of gas masks for the Army, many of whom volunteered from the city, prompted by patriotic motives, and, as soon as the war ceased, their work was no longer necessary, and they returned to their

former occupations. We did not, as a general rule, employ women to take the place of men, this not being necessary by reason of the fact that the Government immediately curtailed the amount of rubber that we were permitted to use, so that our production was reduced in about the same ration as the available supply of male help.

From the president of a furniture company in New York State:

As we possibly advised you in our previous letter, we are manufacturers of fine furniture. During the summer of 1917 we completed a new factory, and about that time the War Department was looking for factories to undertake various lines of work of more or less difficult nature; the manufacture of suitable rawhide saddletrees being one of the difficult articles to equip for manufacture. Having an ideal plant for this purpose and wishing to do something "to help win the war," we equipped and turned over in record time a large volume of saddletrees. The success we were able to accomplish we feel was largely due to the adaptability of women in the rawhide stitching and fitting department. In the past this work had been handled almost entirely by men and was considered difficult men's work. Before starting, failure was predicted on account of impossibility to get skilled help. Sailmakers, awning men, leather workers were all tried and all failed to "make good."

A certain type of young woman was gradually trained, and in a very short time mastered this work. Long before the completion of this work our product was considered the best turned out anywhere in the country.

You can appreciate why we are enthusiastic over woman help and their adaptability to almost any line of work.

After the completion of this war contract in February, we naturally were anxious to get back into our regular line. Our organization being rather disrupted and skilled men being scarce, we distributed these women throughout our factory, and we now have women in all departments, viz, machine, cabinetmaking, finishing, upholstery, trimming, etc., and all are making good and are a big asset to our organization. We believe there is hardly any line of work in which a woman can not adapt herself, if the right type is selected for the various lines. Our experience has been that they learn easier, are more conscientious, steadier, and more painstaking than men.

In a later letter he says:

When men were impossible for us to obtain during the war, we feel that women "saved the day" for us, as they must also have done in hundreds of other industries, so you can understand we have every reason to feel most grateful.

APPENDIX B.

Attitude of labor unions toward admission of women to membership, as shown in excerpts from constitutions and by-laws and in letters written by union officials.

NOTE.—The excerpts have been selected with special reference to the crafts in which women were substituted in men's places during or since the war. Also, only those unions whose constitutions and by-laws or whose officers made plain the relative basis upon which women were admitted are included in the following list.

I. UNIONS WHOSE CONSTITUTIONS AND BY-LAWS OR WHOSE OFFICERS INDICATE THAT WOMEN ARE ADMITTED TO MEMBERSHIP ON EQUAL TERMS WITH MEN.

INTERNATIONAL JEWELRY WORKERS' UNION.

Article 1, section 1, constitution: "This organization * * * shall be composed of male and female workers organized in local unions or as members at large * * *."

Article 3, section 1, constitution: "This organization shall have jurisdiction over the following branches of the jewelry industry: Platinum, gold, and silver workers; chain, bracelet, and locket makers; setters of precious stones, pearls, and imitations thereof; lapidary workers on precious stones and imitations thereof; designers, engravers, chasers, enamelers, and engine turners; emblematic buttons, badges, pins, banners, society emblems, medal and medallion workers, and assemblers of same; modelers, casters, polishers, lappers and colorers; platinum, gold, and silver plating workers; refiners and melters; drop and press hands, and all metal mountings used in optical goods; makers of platinum, gold, and silver findings; watch and clock workers, and repairers thereof; watchcase workers, and repairers thereof; cigarette, vanity, watchcase, mesh bag, and jewel box workers on all metals; the making of all tools and dies used in the jewelry industry; all metal and celluloid button and jewelry vanity workers; all those employed in the making of jewelry novelties out of precious and semiprecious metals of all descriptions."

UNITED BRICK AND CLAY WORKERS OF AMERICA.

The general secretary writes under date of January 20, 1920:

Both men and women are eligible to membership in our organization, the women being employed in the porcelain and pottery plants.

NOTE.—The constitutional provisions for dues, assessments, and benefits do not make discriminations between men and women members.

INTERNATIONAL ASSOCIATION OF OIL FIELD, GAS WELL, AND REFINERY WORKERS OF AMERICA.

The international secretary and treasurer writes under date of January 21, 1920:

During the period of the war, when women worked in the refineries in the places of men who were called into service, we took them into our organization on the same basis as the men.

NOTE.—The current constitution does not mention the subject of admission of women.

INTERNATIONAL UNION OF UNITED BREWERY, FLOUR, CEREAL, AND SOFT DRINK WORKERS.

The general recording secretary writes under date of January 19, 1920:

Women are eligible to membership in our international union, and we have quite a few who belong to our union employed in the yeast, vinegar, cereal, and flour mills.

NOTE.—The constitutional provisions for dues, assessments, and benefits make no discrimination between men and women.

AMERICAN FLINT GLASS WORKERS' UNION.

The secretary-treasurer writes under date of January 17, 1920:

Women are eligible to membership in our organization; that is, in the cutting and lamp working departments. We have no special rules or laws to govern the work they perform. Our regular laws apply.

INTERNATIONAL UNION OF TIMBER WORKERS.

Constitution and working card:

Article 1, page 11, section 1: "This body shall include the following workers: All persons working in the timber industry * * *."

Article 16, page 24, section 1: "A uniform initiation fee of $2 shall be charged by all locals * * *."

Section 2: "The minimum monthly dues of all members shall be $1 per month."

The secretary-treasurer International Union of Timber Workers writes under date of January 22, 1920:

Permit me to say that all female workers working in the timber industry are eligible to membership in our union; in fact, we have several thousand members now.

INTERNATIONAL BROTHERHOOD OF FOUNDRY EMPLOYEES.

Constitution and by-laws, section 1, page 3:

"This organization exercises jurisdiction over all molder's helpers, cupola tenders, chippers, steel workers, casting cleaners, gangway men, yard men, crane men, flask makers, blackners, craters, sand cutters, shaker-outs, flask sorters, pattern carriers, shippers and shipper helpers."

Provisions for dues, assessments, and benefits make no discriminations between men and women members.

The secretary-treasurer writes under date of January 19, 1920:

Women are not only eligible to membership in our organization, but we have quite a number of them in different parts of the country. They are usually employed in making cores in foundries where light castings are manufactured.

(NOTE.—The jurisdiction over core making as a trade is exercised by the International Moulders' Union which does not admit women.)

METAL POLISHERS' INTERNATIONAL UNION.

The general secretary and editor, Metal Polishers' Union, writes on January 21, 1920:

Your letter of January 17, desiring to know if women are eligible to membership in our union received. Yes, in every State except New York.

The trade of metal polishing, whereby the operative works on a swiftly revolving emery wheel, causes small particles of the metal that is being polished to circulate through the air, along with the small particles of the emery or abrasive dust. This being inhaled into the lungs causes the respiratory tract and the lungs themselves to become lacerated and ulcerated, then in breathing in the tubercular bacilli, the weakened lungs, or the diseased lungs, can not throw off the germ, and as a consequence between 60 and 70 per cent of our members succumb to that dread disease, pulmonary tuberculosis.

Our organization is working hard to reduce this by the enactment of laws forcing exhaust systems to remove this dust. It is a continual fight to have the system installed and even a much harder fight to have the factory inspectors compel the manufacturers to keep the exhaust system in an efficient running condition to remove the dust.

For that reason we discourage women as much as possible from entering this dangerous trade, but whenever the manufacturer insists on hiring women, we do not insist on this objective, but do demand, however, that they shall receive the same rate of wages for an equal amount of work performed as the men receive.

International and local laws of the Metal Polishers' International Union, article 10, section 1: "There shall be a universal dues of not less than $1.50 per member per month."

II. Unions Which Admit Women, but on a Reduced Due and a Reduced Benefit Basis.

(See note at head of this appendix concerning basis of selections.)

PIANO, ORGAN AND MUSICAL INSTRUMENT WORKERS' INTERNATIONAL UNION OF AMERICA.

Article 25, pages 37 and 38, constitution:

"SECTION 1. Female employees of the piano, organ and musical instrument industry may be accepted to membership in the international union upon the payment of one-half the regular initiation fee.

"SEC. 2. All female members shall pay into the funds of the international union a weekly due of one-half of the regular dues; they shall also pay one-half of all assessments that may be levied from time to time, excepting the annual label assessment, which they shall be required to pay in full.

"SEC. 3. Female members shall be entitled to one-half the amounts of all benefits paid male members, excepting sick benefit. Female members shall receive one-half of the amount of sick benefit paid male members, excepting during periods of pregnancy and for six weeks after confinement, when no sick benefit shall be paid, nor shall any sick benefit be paid for sickness due to or resultant from pregnancy.

"SEC. 4. Female members in order to be entitled to any of the benefits guaranteed by our constitution must comply with the general provisions of the constitution by which male members are governed, excepting as to initiation fee, dues and assessments."

The international president writes on January 21, 1920:

Our organization accepts for membership therein female as well as male employees. We ask the same wages, the same conditions, for female workers as we do for male workers.

UNITED LEATHER WORKERS' INTERNATIONAL UNION.

Constitution, local branches, section 5, page 34:

"The monthly dues * * * for apprentices and females not less than 60 cents." (Full membership $1.15.)

General constitution, section 21(b), page 12:

"Strike benefits for apprentices and female members shall be $3 per week." (For full members the benefits range from $5 to $7 per week.)

Section 22(g), page 16:

"Apprentices and female members [shall receive] one-half the amounts [of benefits granted full members]."

BAKERY AND CONFECTIONERY WORKERS' INTERNATIONAL UNION OF AMERICA.

The international secretary writes on January 28, 1920:

Women are not barred from becoming members in our organization and receive all benefits except sick benefits, but on that account they pay less dues than the male members.

About 75 per cent of the candy workers are women, and we have tried hard for the past few years to organize them with poor results, as that industry has been underpaid until lately when wages were increased on account of intentions to organize.

GLASS BLOWERS' ASSOCIATION OF THE UNITED STATES AND CANADA.

Constitution, article 1, section 4, page 3:

"This association shall exercise jurisdiction over and organize all men and women employed in and around glass bottle factories, and they shall be governed by such laws as may hereinafter be arranged and adopted by the Glass Blowers' Association with the approval of these workmen or their representatives."

Article 11, section 67, page 31: * * * "Each member shall pay assessments as follows: Members who are making $4 a day and under shall pay one-half the regular assessment; members who are making over $4 a day shall pay the regular assessment. * * *"

Appendix, section 2, page 42: "It shall be obligatory on the part of the members of the glass factory employees' department to participate in the death beneficiary department, but new members shall not be permitted to join this department until after the expiration of three months from the time of their admission, after which time they shall pay one-half the regular assessment and receive one-half the regular benefit, or they shall pay the regular assessment and participate in the full benefit, at the discretion of the members. Death assessments levied in this department shall be paid within 30 days after notification by the general secretary. This rule is not to apply to women members, but it shall be optional with them to join the death beneficiary department."

The secretary of the Glass Bottle Blowers' Association of the United States and Canada writes:

Up to six years ago our association was composed exclusively of skilled glass workers, but the innovation of machinery and the introduction of other kinds of labor have forced us to change our charter with the American Federation of Labor, by which we now have jurisdiction over all men and women employed in and around glass factories. We have taken in quite a number of women who do not work in the factory; some work in the packing houses and some in the grinding room and at other work.

AMALGAMATED SHEET METAL WORKERS' INTERNATIONAL ALLIANCE.

The general secretary-treasurer writes on January 19, 1920:

Women are accepted into our organization from our provisional local unions. * * * In the general locals, such as those engaged in ship building, in the railroad industry, and in the building trades shops, there are hardly ever any women employed, as the work is quite heavy and particularly on the outside, hazardous, and is not considered a lucrative field for women.

INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS AND TELEPHONE OPERATORS DEPARTMENT.

Constitution, article 36, pages 50-51:

"SECTION 1. Any female engaged in the manufacture or operation of any electrical apparatus or device may become a member of any local union, subject to all the provisions of this constitution, except as provided for in the following sections of this article.

"SEC. 2. Any local union composed of male and female or female electrical workers shall be classified and chartered as local union, class B, with a designating number.

"SEC. 3. The local union class B charter and iniation fee for female members shall be not less than $1.50. The monthly dues shall be not less than 75 cents.

"SEC. 4. Each local union, class B, shall pay to the international secretary at the international office, as per capita tax, the sum of 40 cents out of the monthly dues collected by the financial secretary from each female member.

"SEC. 5. Twelve cents of the monthly per capita tax for female members shall be placed in the general fund, 4 cents of the per capita in the convention fund, 5 cents of the per capita tax in the death benefit fund, 5 cents of the per capita shall be placed in the defense fund, and 14 cents to be placed in the difficulty benefit fund.

"SEC. 6. Every female member of a local union, class B, in fellowship and continuous good standing in the I. B. E. W. for one year or more preceding her death shall, in case of death, be entitled to a funeral benefit in the sum of one hundred and fifty dollars ($150.00), and shall be exempt from the assessments and debarred from the benefits as provided in Article XXI, section 1, of this constitution.

"SEC. 7. Traveling cards issued to female members of a local union, class B, shall be governed by Article XXIII of this constitution, but in no case can they be deposited in any L. U. except L. U., class B or class A.

"SEC. 8. All local unions, class B, shall come under the jurisdiction of Shop Electrical Workers.

"SEC. 9. The basis of representation at the I. C. for female members of L. U.'s, class B, shall be one per capita tax vote for each female member, and one delegate for every one hundred female members or majority fraction thereof. Female members of a local union, Class B, shall not be eligible to the office of president of local union composed of male and female members or any international office."

INTERNATIONAL ASSOCIATION OF MACHINISTS.

Constitution of the grand lodge, district and subordinate lodges: Article 14, pages 76, 77.

"SECTION. 1. Women working in the machine industry under our jurisdiction shall be admitted to membership in our association upon making application in accordance with our constitution, and by paying one-half of the initiation fee charged journeymen machinists in the respective localities; and after being admitted to membership, shall pay not less than 50 cents per month dues. Thirty (30) cents of this amount shall be forwarded to the grand lodge as per capita tax for each member.

"SEC. 2. In the event of assessments being levied by the grand lodge, they shall pay one-half of the assessment levied upon journeymen machinists.

"SEC. 3. In the event of a strike or lockout they shall receive one-half benefits under the law governing such cases, after being approved by the general executive board.

"SEC. 4. In the event of death they shall receive one-half of the amount paid journeymen, as per section 5a, Article 11, of the grand lodge constitution.

"SEC. 5. In case of unemployment they shall be entitled to 'out of work' stamps, for which the local of which they are members shall pay to the grand lodge 20 cents each as per sections 1 to 2, article 12, grand lodge constitution."

Article IX, page 72, section 1: "Any boy engaging himself to learn the trade of machinist must serve four (4) years. * * *"

III. UNIONS WHOSE CONSTITUTIONS AND BY-LAWS OR WHOSE OFFICERS DECLARE WOMEN TO BE BARRED FROM MEMBERSHIP.

Women have been substituted in men's places in all crafts included, as shown by the tables in Section II.

ELASTIC GORING WEAVERS' AMALGAMATED ASSOCIATION OF THE UNITED STATES.

The general secretary writes on January 21, 1920:

Women are not eligible for membership in our association at the present time, as no women are employed at our branch of the industry.

UNITED BROTHERHOOD OF CARPENTERS AND JOINERS.

The general secretary writes under date of January 19, 1920:

In replying to yours of January 17, I wish to advise that women are not admitted to membership in the United Brotherhood of Carpenters and Joiners of America.

PATTERN MAKERS' LEAGUE OF NORTH AMERICA.

The general president writes on January 19, 1920:

Women do not follow our trade and they would not be eligible to membership in our organization.

INTERNATIONAL MOULDERS' UNION OF NORTH AMERICA.

(Exercises jurisdiction over core makers.)

Constitution and rules of order, article 13, section 6, page 37:

"Any member, honorary or active, who devotes his time in part or in whole to the instruction of female help in the foundry or at any branch of the trade shall be expelled from this union."

Among the resolutions passed at the 25th convention are the following as found in the constitution and rules of order, page 66:

"13. *Resolved*, That the decision of this convention be the restriction of the further employment of child and woman labor in union core rooms and foundries, and eventually the elimination of such labor in all foundries by the example set by union foundries in the uplifting of humanity.

"*Resolved*, That we appeal to the workingmen of both countries when depositing their ballots to vote for the candidates who will pledge themselves to vote for measures and legislation which will eradicate this evil.

"*Resolved*, That the incoming officers be directed to, either by themselves or in cooperation with others in the labor movement, give their best thought and effort in opposing the employment of female and child labor in jobs recognized distinctively as men's employment."

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